Warp Weighted Looms: Then and Now

Anglo-Saxon and Viking Archaeological Evidence and Modern Practitioners

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Table of Contents

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List of Figures

Abstract

This thesis examines the warp weighted loom during the Anglo-Saxon and Viking eras in England through archaeological, linguistic, and art evidence, supported by similar information about the loom from Northern Continental Europe. Some evidence from other parts of the world where this specific type of loom was used is also included for clarity. In order to further understanding of the possible functioning and abilities of the loom, modern individuals with experience weaving with this early medieval technology were sought out to answer a questionnaire. The analysis of data gathered is supported with evidence from interviews of some of the respondents. The weavers who answered the questionnaire were primarily associated with the living history or re-enactment movements; therefore a history of these movements and their goals is also included. An analysis of the responses to the questionnaire, including thoughts about how these answers might advance academic understanding of the loom, completes the thesis.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Dedication

For Dr Stephen Law and Dr Theresa Vaughan, for a particularly memorable conversation on my birthday in 2000. You started it. For my friends on the Ravelry board Friends of Abby's Yarns, who know that the answers to most fibre craft questions are: It Depends, Sample, and Four Pounds. Most of all for my beloved husband, who did without his wife for far too long. Thank you all.

1. Introduction

In 1964, the first monograph about an ancient weaving technology, the warp weighted loom, was published. This unparalleled work by Norwegian researcher Marta Hoffmann, instigated by her curiosity about exhibits in the local museum, examined the work of six weavers in western Norway for whom the use of the loom had not been completely lost. She augmented her ethnography with extensive work examining archaeology, linguistics, folklore, and art relating to the loom.[1]

Since the time of that publication, many advances have been made in the areas of archaeology, art history, information gathering and dissemination, and linguistics. There has also been renewed interest in understanding the past through hands-on practice, creating fields of study such as experimental archaeology and living history. Textile history is another area of academic study that has flowered comparatively recently. Even with all these advances, there has yet to be another study of Northern European warp weighted looms with the breadth and scope of Hoffmann's monograph.

That being said, there are limitations to any work. In her exploration of the warp weighted loom, Hoffmann searched for weavers who still knew how use that particular weaving tool. After years of searching, she was only able to locate three sets of women, working in pairs, who lived along the western shores of Norway.[2] These women had not practiced their craft since before the advent of World War II, some fifteen years previous to the time when their work was observed and

[1] Marta Hoffmann, *The Warp-Weighted Loom: Studies in the History and Technology of an Ancient Implement* (Oslo: Universitetsforlaget, 1964). Her study of warp weighted loom weavers was conducted in the 1950s; her book was first published in Norwegian in 1964, then translated into English that same year.

[2] Hoffmann, *Warp-Weighted Loom*, pp. 1, 2, 39. See also map before page one.

documented in the 1950s.[3] The Lappish set of weavers 'seemed clumsy and awkward', likely due partly to lack of practice, and partly because weaving with the loom was a relatively recent skill acquisition for their people.[4] It should also be noted that all of these women wove thick traditional cloth in either an over/under tabby weave or tapestry weave, or with a single heddle bar, the simplest pattern found in weaving, not in the more complex weave patterns known from archaeological finds from Anglo-Saxon and Viking era England.[5]

In England, the loom is thought to have started being replaced by other weaving technologies, beginning in large trading cities such as York, during the tenth century AD.[6] To confine the research to manageable amounts of data within the time frame allowed for this thesis, the decision was made to limit the geographical scope of the thesis to England proper and the time frame to the years 450-1100 AD, a convenient frame for the Anglo-Saxon and Anglo-Viking cultures. Over the course of the research, it was discovered that excluding evidence outside this purview was problematic, at best. Still, the attempt was made to stay within these boundaries.

The warp weighted loom is, first and foremost, a tool. Archaeology can tell us many things about the loom; which cultures used it to make cloth, where a loom was located within a village or structure, weave patterns possibly produced on the loom type from surviving cloth samples, and possible secondary uses the weights assumed when not used for weaving, among other things. Art can be helpful for filling in missing information for the parts of the loom that do not survive in archaeological conditions. Until usage is demonstrated, however, a tool is just an

[3] Hoffmann, *Warp-Weighted Loom*, pp. 56, 81, 92.

[4] Hoffmann, *Warp-Weighted Loom*, p. 92, 74.

[5] Hoffmann, *Warp-Weighted Loom*, p. 77, 55.

[6] Penelope Walton Rogers, 'The Re-Appearance of an Old Roman Loom in Medieval England', *The Roman Textile Industry and its Influence*, eds., Penelope Walton Rogers, Lise Bender Jørgensen and A. Rast-Eicher (Oxford: Oxbow Books, 2001), pp. 158-71 (p. 162).

inert object for which there is an incomplete understanding; therefore modern weavers who use this loom type were sought out.

By the time surviving Norwegian specialist weavers working with the warp weighted loom were documented by Dr Marta Hoffmann for her book *The Warp-Weighted Loom*, [7] the tool had become an antiquated relic, used by less than a handful of families specifically for weaving heavy wool blankets or coverlets in traditional tabby patterns.[8] While skilled in their own specialized knowledge base, these six women did not have the ability to create all of the various types and weave patterns of cloth thought to be the product of the warp weighted loom which was found throughout most of Europe until the decline of evidence for the tool.

Following a craft tradition such as weaving requires a certain level of creative adaptivity to compensate for influences outside of the weaver's control. Factors such as light and weather conditions, experience, differing physiology between teacher and student, injury, ageing, and nuance created by the materials themselves based on fibre growing conditions, spinning, dyeing, and humidity all require minor alterations in technique. Weave and colour patterns change with the availability of materials and exposure to other cultures through trade and migration, as well as creativity, adaptation, and innovation. All of these factors together indicate there can be no single 'correct' way to perform traditional techniques using historically appropriate tools, but a spectrum of movements used when working with hand manipulated tools that create similar, but not identical, finished products.[9] The expectation of exact replication of a craft, whether through movement or completed

[7] The hyphen in *warp-weighted* loom is an older usage, included here as the exact title of the book. Throughout this dissertation, the more current usage, *warp weighted loom*, without the hyphen, is followed.

[8] Hoffmann, *Warp-Weighted Loom*, p. 48.

[9] Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill* (London: Routledge, 2000), p. 147.

items, is a product of the Industrial Age, where it is a necessity for the function of machines and the modern perception of time and material conservation.[10]

A variety of cultures and peoples used the warp weighted loom throughout Northern Europe during the millennia of its functional existence. It seems unlikely that the same techniques were practiced consistently through sizeable geographical areas, large spans of time, or between cultures. Individual adaptation of tools and set up is also likely between individual weavers. While exact knowledge of how any particular culture or person chose to set up and weave on this tool has been lost to history, a group of modern weavers are working to re-engage with the technology to determine possible methods for creating cloth comparable to archaeological finds. Whether the methods discovered to be workable are historically accurate may be impossible to know, but some ideas and techniques for loom usage can be dismissed as highly improbable based on the experience of these weavers.[11]

Until now, evidence for the warp weighted loom has been examined through the narrow lens of the documented work of six women as they wove three separate thick cloths on warp weighted looms built after World War II, nearly a thousand years after the Norman invasion that signalled the end of the Anglo-Saxon and Anglo-Viking eras in England. It might be time to re-examine the evidence through a wider range of workable techniques that have become available through the experimental work of twenty-first century weavers attempting to replicate early medieval textiles.

These modern weavers also form an experienced knowledge base that can further the work of experimental archaeologists researching textiles and textile tools. Years of experience give them the ability to determine which methods are likely to

[10] Ingold, *Perception of the Environment*, p. 324.

[11] Mike Crang, 'Magic Kingdom or a Quixotic Quest for Authenticity?', *Annals of Tourism Research* 23 (1996), pp. 417, 419.

create known wear patterns in tools or insight to possible circumstances that would result in tool positioning found in archaeological sites. Experienced weavers who use the warp weighted loom may even be able to determine whether the loom is capable of producing the item believed to have been made with its use.[12]

For the historiographic evidence in this thesis, an attempt was made to stay within the geographic and time constraints of the specified era, but due to the lack of linguistic and art sources, it became necessary to expand beyond these limitations. A conscious effort was made to specifically exclude the evidence of the Classical Greece and Roman Empires, as it is out of the purview of this thesis. However, because many scholars writing about the warp weighted loom comment on the art and linguistic evidence from that era, it was not entirely avoidable.

[12] Alexander Cook, 'Sailing on the Ship: Re-enactment and the Quest for Popular History', *History Workshop Journal* 57 (2004), p. 253.

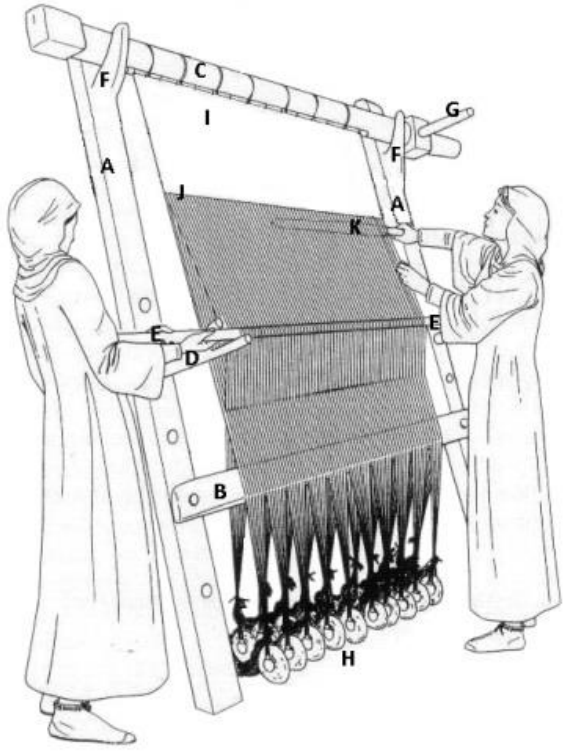

Figure 1. Diagram of Warp Weighted Loom. Based on a drawing from Penelope Walton Rogers *Cloth and Clothing*, page 29 (figure 2.21).

A. Loom uprights.
B. Shed bar or rod.
C. Cloth beam.
D. Heddle pegs.
E. Heddle bar. The attached heddles or heddle loops are not readily visible on this diagram.
F. Brackets or ratchets for cloth beam.
G. Crank shaft or spoke.
H. Warp weights.
I. Cloth.
J. Fell line.
K. Weaving sword.

2. The Warp Weighted Loom: The Evidence

'The most important piece of domestic equipment in the Anglo-Saxon house may well have been the loom.'

– D. Wilson, *The Archaeology of Anglo-Saxon England* (1976)

'The inherent vulnerability of textile means that complete textiles, or even large fragments of textiles, are almost completely lacking from some periods of time. This absence is particularly regrettable as regards the post-Roman, pre-1100 era in the British Isles, since the richness, and desirability of the finest textiles is attested from documentary sources.'

Elisabeth Coatsworth and Gale R. Owen-Crocker, *Medieval Textiles of the British Isles AD 450-1100: An Annotated Bibliography* (2007)

From birth to death, human lives are surrounded by fabric. We dry ourselves with towels, sleep on pillows and mattresses, lay between sheets, wear clothes, sit on fabric covered cushions and couches, walk on carpets, and cover our windows with curtains. Cloth is some of the most versatile material used in daily life, now as well as for people living in England from 450-1100 AD.

Rich burials in Britain have a variety and quality of textiles that suggests that cloth was highly valued. These textiles did not appear from nowhere, but were crafted by skilled hands using technologies already millennia old.[13] The warp weighted loom, used to weave hand spun thread into cloth, was the tool of choice for Anglo-Saxon and Viking era weavers in England.

Unfortunately, the textiles themselves tell us very little about their construction. More than four thousand textile fragments from archaeological finds dating to that time frame were catalogued and examined by Gale R. Owen-Crocker

[13] Elizabeth J. Wayland Barber, *Prehistoric Textiles: The Development of Cloth in the Neolithic and Bronze Ages with Special Reference to the Aegean* (Princeton, New Jersey: Princeton University Press, 1992), p. 213.

and Elizabeth Coatsworth for the Manchester Medieval Textiles Project. Very few were larger than a few millimetres square, most are found on the backs of pins or brooches.[14] A majority of these textiles survive only as mineralized replacements from the rusting process, or impressions left on metallic objects, which are difficult to examine, and do not show both sides of the textile, a detail that is helpful in determining possible construction methods.[15] The most famous Anglo-Saxon textile, the Bayeux Tapestry, is an enormous undertaking for weavers due to the length of the piece, but is a simple tabby weave. The borders, which may provide clues for weaving techniques, have been altered by restoration work, or hidden on the back of the work, which is unavailable for examination.

The few publications that attempt to organize and categorize textile finds, such as that by Lise Bender Jørgensen in her book *1000 Years of North European Textiles*, tend to group the textiles into weave patterns, which is not particularly helpful for understanding loom technology, as most weave patterns can be accomplished on all known primitive loom types by trained weavers.[16] Therefore, to understand the warp weighted loom, believed to be the most common loom type used from 450-1100 AD, evidence of the loom itself must be examined.

[14] Elizabeth Coatsworth and Gale R. Owen-Crocker, *Medieval Textiles of the British Isles AD 450-1100: an Annotated Bibliography,* BAR Series 445 (Oxford: Archaeopress, 2007), pp. 8, 13.

[15] Coatsworth and Owen-Crocker, *Medieval Textiles*, p. 16.

[16] The textile charts in the Bender Jørgensen book were taken, undigested, from unpublished raw data created by Elisabeth Crowfoot. The information is proving, on further examination, to be unreliable. Personal communication with Gale R. Owen-Crocker dated 14 Nov 2013.

2.1. The Wood of the Loom: the Frame, Heddle Bars, Heddle Pegs, Cloth Beam and Spokes

Currently, there are no British archaeological finds that are positively identified as the wooden parts of a warp weighted loom, including heddle bars and heddle pegs.[17] However, it is possible that several pieces of wood turned to charcoal by fire found among lines of warp weights in Gloucester and Dover may be loom uprights (see figure 2).[18] These wood fragments appear as sections of squared off boards with holes drilled roughly equidistant from each other along the length of the board. These holes start some distance from the top in the Gloucester artefact (see figure 3), but the top section of board is missing from the Dover example.

It appears that the loom from the 1975 Dover excavation likely tipped slightly sideways as it was falling over in the fire, if the angle of the upright is examined in relation to the lines of warp weights (see figure 2).

[17] Barber, *Prehistoric Textiles*, p. 109.

[18] David A. Hinton, 'The Large Towns, 600-1300', *The Cambridge Urban History of Britain*, vol. 1, ed. D. M. Palliser, P. Clark and M. J. Daunton (Cambridge: University Press, 2000), p. 232; Brian Philp, *The Discovery and Excavation of Anglo-Saxon Dover* (Dover: Kent Archaeological Rescue Unit, 2003), plates III and IV; John W. Hedges, 'Appendix 6: The Textiles and Textile Equipment', in 'Excavations at 1 Westgate Street, Gloucester, 1975', C. M. Heighway, A. P. Garrod, and A. G. Vince, *Medieval Archaeology* 23 (1979), 159-213 (p. 192).

Figure 2. Photograph of several lines of loom weights and a possible wood loom upright from Dover. The upright is directly above the smaller measuring stick. Photograph from *The Discovery and Excavation of Anglo-Saxon Dover*, Plate III.

These artefacts are currently identified as warping boards or warping parts of a floor loom.[19] It is likely that they have been misidentified, as some loom uprights are known to have similar holes, as is seen with the positively identified warp weighted loom upright from Gården under Sandet (see figure 4) and the Faroese loom documented by Marta Hoffmann (see figure 16). If the charred wood was part of a warping board to measure warp threads, as has been suggested, the holes should have remnants of pegs inside, which was not noted.[20] The Gloucester artefact has a large, square hole near the top of the board that seems to be a place to join a frame. If another section of a frame was slotted into this hole, the pegs would be pointed to the

[19] Floor looms do not have an integral part specifically for measuring warp thread. A separate tool, currently called a warping board or warping frame, is necessary. Hedges, 'Textiles and Textile Equipment', p. 191.

[20] Philp, *Anglo-Saxon Dover*, p. 21.

interior or exterior of the frame, making them unusable for measuring warp (see figure 3). The square hole might be useful as a place to insert the bracket for a cloth beam, however.

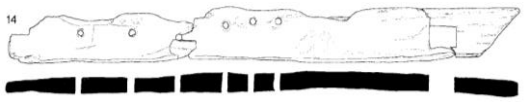

Figure 3. Possible loom upright from Gloucester currently identified as a warping board. Drawing from *Excavation at Gloucester 1975*, p. 192 (fig. 13).

The need to create a completely separate tool is negated if the holes in loom uprights are used with removable pegs as a warping board. Creating a few pegs to adapt an already existing tool to a secondary use would take much less effort as well as conserving available materials. Using smaller branches from an already felled tree to make pegs rather than finding another tree large and straight enough to create a frame and then still having to make those same pegs seems a more elegant solution for measuring warp threads.

The extremely limited evidence for the loom frame is due partly to the comparative rarity of wood survival in the archaeological record, especially in the soil conditions of Britain.[21] On the occasions where loom weights have been found *in situ* indicating a loom, the evidence is often due to the building burning down, so it is likely the wood of the loom became fuel for the flames.[22] Another likely reason for the dearth of wood loom parts might be practicality. If a wooden part of the loom

[21] Coatsworth and Owen-Crocker, *Medieval Textiles*, pp. 13-14.

[22] Examples of weights found in burned buildings can be found in Else Østergård, *Woven into the Earth: Textiles from Norse Greenland* (Oxford: Aarhus University Press, 2004), p. 59; Marianne Rasmussen, ed., *Iron Age Houses in Flames: Testing House Reconstructions at Lejre*, trans. by Anne Bloch Jørgensen and David Robinson (Leijre: Leijre Historical-Archaeological Experimental Centre, 2007), p.118; Ingrid Schierer, 'Experiments with the Warp-Weighted Loom of Gars-Thunau, Austria', *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles*, ed. by Peter Bichler, Karina Grömer, Regina Hofmann-de Keijzer, Anton Kern and Hans Reschreiter, British Archaeological Reports International Series 1351 (Oxford: Archaeopress, 2005), pp. 101-105 (p. 103); Penelope Walton Rogers, *Cloth and Clothing in Early Anglo-Saxon England AD 450-700* (York: Council for British Archaeology, 2007), pp. 31, 32; Stanley E. West, *West Stow: The Anglo-Saxon Village 1: Text*, East Anglian Archaeology, 24 (Ipswich: Suffolk County Planning Department, 1985), p. 138.

broke, a replacement part could be fairly easily acquired or created. The broken section would likely have been added to the fire for heating the house or the cooking fire, or reused in a manner that made identification as part of a loom more difficult, had it survived.

Though pieces have been found, no complete warp weighted loom has survived in Europe from the medieval period.[23] Some fragments of looms which have been positively identified are located in parts of Iceland and Greenland. Cloth beams found in Reykjavík and Skógar had been reused as parts of sheep folds and then fence posts before being identified.[24] Gården under Sandet in Greenland, first settled around 1000 AD and abandoned by 1350 AD, produced the best archaeological evidence of wooden sections of the loom to date: two cloth beams, a shed bar, pieces of uprights and a section of a heddle bar (see figure 4).[25] Though these finds date to well after the warp weighted loom falls out of the archaeological record in England, it seems unlikely the primary parts of this simple loom altered much in the intervening centuries.

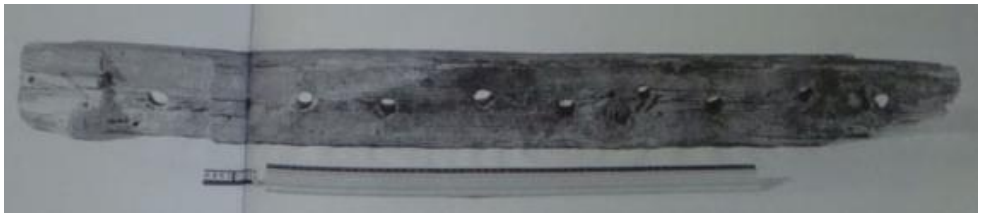

Figure 4. Section of loom upright from Gården under Sandet. Image from *Kirkes Væv*, pp. 82-83 (fig. 45b). This piece is the lower section of an upright, determined by the multiple holes and the dovetail for the shed bar.

[23] Margrethe Hald, *Ancient Danish Textiles from Bogs and Burials: a Comparative Study of Costume and Iron Age Textiles*, trans. Jean Owen, 2nd edn, Publications of the National Museum: Archaeological-Historical Series, 21 (Copenhagen: National Museum of Denmark, 1980), p. 203.

[24] Elsa E. Guðjónsson, 'Warp-Weighted Looms in Iceland and Greenland: Comparison of Mediaeval Loom Parts Excavated in Greenland in 1934 and 1990-1992 to Loom Parts from Eighteenth and Nineteenth Century Warp-Weighted Looms in Iceland; Preliminary Remarks', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), pp.178-195 (pp. 180, 182).

[25] Jette Arneborg and Else Østergärd, 'Notes on Archaeological Finds of Textiles and Textile Equipment from the Norse Western Settlement in Greenland: A Preliminary Report', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), pp. 162-177.

With scant archaeological evidence available, the study of linguistics offers some insight into understanding the wooden parts of the loom. In searching for linguistic evidence of the loom in Britain, it is interesting to note there is no surviving Anglo-Saxon word for loom.[26] A list of terms for loom parts for that language has been gathered by Maren Clegg Hyer and Gale R. Owen-Crocker: *cipp, stodlan, crancstæf, uma, lorh, webbeam, websceaft, meoduma, hefeld* and *hefeldþræd*.[27]

According to the Bosworth and Toller *Old English Dictionary*, *cipp*, *uma* (or *huma*), *lorh* (or *lorg*), *webbeam*, *websceaft* and *meoduma* all translate as 'a weaver's beam', which could refer to most parts of the loom.[28] *Stodlan* has been interpreted as 'a sley or part of a loom'.[29] According to the Oxford English Dictionary, a *sley* is a tool used to beat the weft thread into place, deriving from the Old English *slæge* for striking or killing.[30] The etymology suggests that a *stodlan* was the name for a separate weft beating tool, and not part of the loom. Wilson suggests that perhaps this tool is a pin beater.[31]

Heddle bars translate to *hefeld* in Old English.[32]

[26] Maren Clegg Hyer and Gale R. Owen-Crocker, 'Woven Works: Making and Using Textiles', in *The Material Culture of Daily Living in the Anglo-Saxon World*, ed. by Maren Clegg Hyer and Gale R. Owen-Crocker (Exeter: University of Exeter Press, 2011), pp. 157-184 (p. 168).

[27] Hyer and Owen-Crocker, 'Woven Works', pp. 168, 169.

[28] Joseph Bosworth, *An Anglo-Saxon Dictionary: Based on the Manuscript Collections of the Late Joseph Bosworth*, ed. by Thomas Northcote Toller (Oxford: Clarendon Press, 1898), pp. 124, 676, 1088, 1180.

[29] Joseph Bosworth and T. Northcote Toller, *An Anglo-Saxon Dictionary* (Oxford: Clarendon Press, 1898), p. 923. It should be noted that the compliers of the dictionary were not weavers, however their definitions are what is currently available for citation and to non-specialists.

[30] 'Sley', *Oxford English Dictionary* <www.oed.com> [accessed 9 Jan 2014]; Bosworth and Toller, *An Anglo-Saxon Dictionary*, p. 883.

[31] D. Wilson, *The Archaeology of Anglo-Saxon England* (London: Methuen and Co. Ltd., 1976), p. 273.

[32] Heddle loops are sensibly called *hefeldþræd*, as the loops are made of string or thread attached to a heddle bar. Heddle loops are necessary for the working of the loom, but do not exist in any artistic or archaeological context, and will not be discussed in this section of the thesis.

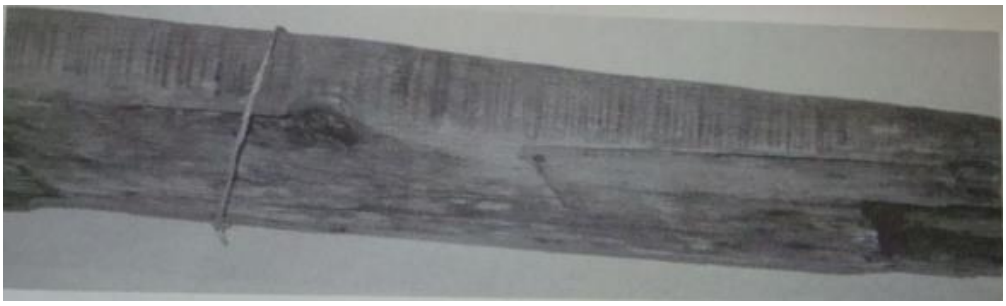

Figure 5. Shed rod or bar with wear marks from Gården under Sandet. Image from *Kirkes Væv*, p. 137 (fig. 84). The grooves were created by warp threads rubbing across the bar over the course of years.

Heddle bars are a particularly difficult part of the loom for modern researchers to decipher. Part of the difficulty is the nature of the heddle bar. It is essentially a round, straight stick, which is easily replaced, mislabeled, or used for any number of things if not closely associated with other artefacts. Necessary to make the work of weaving go more swiftly and consistently, heddle bars obviously existed, as there is linguistic, art and textile evidence supporting the use of them.[33]

The question becomes not whether heddle bars existed, but how many were used, and how they were used.[34] The modern weavers documented in film in the 1940s and 1950s, with a living tradition in warp weighted weaving, used a single heddle bar to weave traditional blankets.[35] However, even though it is currently perceived as the typical practice and very useful for weaving plain weave or tabby,

[33] Elsa E. Guðjónsson, 'Járnvarðr Yllir: A Fourth Weapon of the Valkyries in Darraðarljóð?' *Textile History*, 20.2 (1989), pp. 185-97 (p. 185); Aubrey S. Henshall, 'Textiles and Weaving Appliances in Prehistoric Britain', *Proceedings of the Prehistoric Society: New Series*, 16 (1950), pp. 130-162 (p. 145).

[34] One such discussion is the ability of the warp weighted loom as a tool to create a 2/1 twill. Some scholars believe that the pattern is not likely because a weaver cannot use the natural shed created by draping some of the warp threads over the shed bar. See Walton Rogers, *Cloth and Clothing*, p. 34; Kevin Leahy, *Anglo-Saxon Crafts* (Stroud: Tempus, 2003), p. 72; Hyer and Owen-Crocker, 'Woven Works', p. 167. Others think that the pattern is possible on the loom, using multiple heddle bars. See Eva B. Andersson, *Tools for Textile Production, from Birka and Hedeby: Excavations in the Black Earth, 1990-1995*, Birka Studies 8 (Stockholm: Birka Project for Riksantikvarieämbetet, 2003), p. 22. Experimentation demonstrates a 2/1 twill is easily achieved on a warp weighted loom.

[35] *Norwegian Folk Museum*, 'Grenevev del 3 av 3 – Olderdalen og Manndalen 1947' <http://www.youtube.com/watch?v=6PD-FASC6ZQ> [accessed 2 Feb 2013]; 'Glimpt fra grenenveving – Manndalen, Troms 1955' <http://www.youtube.com/watch?NR=1&v=zXyaj16AmLg&feature=endscreen> [accessed 8 Mar 2013].

weaving with a single heddle bar as a living tradition is only found in Norway.[36] The use of multiple heddle bars has artistic and linguistic evidence supporting the practice, with written evidence primarily found in Icelandic sources.[37]

The purpose for multiple heddle bars is to allow more variation in the number of available sheds, and therefore more variation in weave patterns. When warp threads are threaded through a heddle loop tied to a heddle bar, it is much easier to keep the pattern consistent. Human error tends to creep in if each warp thread has to be lifted individually to allow the weft through. It also takes a great deal more time to pick up each thread rather than lifting a bar that lifts all of the desired threads at once. Three heddle bars are necessary for four shed patterns such as a diamond twill, unless the weaver chooses to pick up individual warp threads by hand.[38]

No pictorial evidence is available from Anglo-Saxon or Viking era England, so researchers must look elsewhere. The only known early medieval artwork with a warp weighted loom is the Kirriemur Sculpted Stone (see figure 12), thought to be Pictish in origin. Unfortunately, the image is very simplistic and weather-worn so that the number of heddle bars is impossible to determine, though a single heddle bar seems likely.

Some images of warp weighted looms from outside Britain have demonstrable evidence of multiple heddle bars. The earliest example comes from the Naquane Rock in Northern Italy, from the Bronze Age. Several of the line drawings carved into the rock have two or three heddle bars depending on individual interpretation (see figure 7). The loom depicted on the Hallstatt urn shows three

[36] Hoffmann, *Warp-Weighted Loom*, p. 13.

[37] Hoffmann, *Warp-Weighted Loom*, p. 115.

[38] Lise Bender Jørgensen, *North European Textiles until 1000 AD* (Aarhus: Aarhus University Press, 1992), p. 122; Lilli Fransen, Anna Nørgaard, and Else Østergård, *Medieval Garments Reconstructed: Norse Clothing Patterns* (Denmark: Narayana Press, 2011), p. 26 (caption).

heddle bars and was likely set up for twill (see figure 8).[39] Closer in time, though more distant in space, are the paintings on several Greek urns, most notably the Chuisi and Boetian urns, with two heddle bars each (see figure 6). A 1770s drawing of an Icelandic loom by Sæmundur Magnússon Hólm (see figure 14) for a book on the Icelandic economy by Ólafr Ólafsson and the subsequent woodcut based on the drawing (see figure 15), both show three heddle bars.

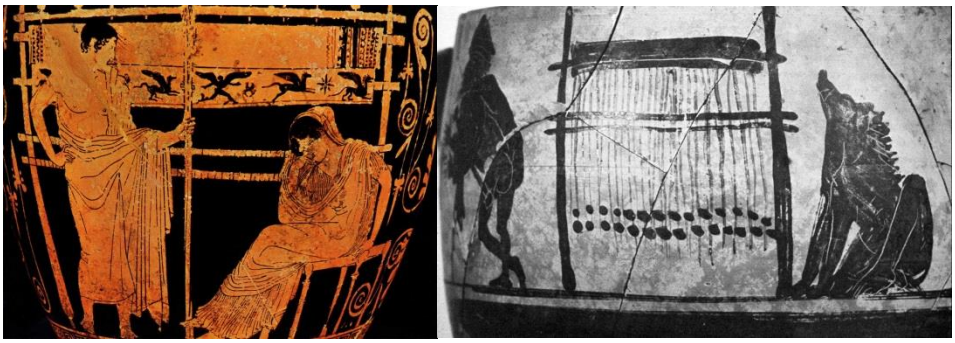

Figure 6. Chuisi and Boetian urns showing multiple heddle bars. The Chuisi urn is held by the Archaeological Museum of Chuisi, and the Boetian urn is held by the Ashmolean Museum.

The best written evidence for multiple heddles comes from detailed descriptions of weaving on a warp weighted loom by Guðrún Bjarnadóttir. Recorded around 1870, Bjarnadóttir worked with the loom when she was a young girl.[40] She reports working with multiple heddle bars, including one specifically called a *miðskaft*, or middle shaft, which implies the use of at least three, if not more, heddle bars.[41]

Another Icelandic word is reported by Elsa Guðjónsson relating to a warp weighted loom owned by the National Museum of Iceland from around 1900. The loom was set up to weave tabby and called *einskefta*, which translates to 'one shaft', indicating the need for a word for a loom with a single heddle bar. Logically, if there

[39] Henshall, 'Prehistoric Britain', p. 145.

[40] Hoffmann, *Warp-Weighted Loom*, p. 115.

[41] Hoffmann, *Warp-Weighted Loom*, p. 54.

is a term specifying a single shaft, it follows that multiple heddle bars were a common occurrence.[42]

Closer in time to Anglo-Saxon Britain, the Icelandic poem known as *Darraðarljóð*, written down in the late thirteenth century from earlier oral traditions, describes the weaving work of mysterious women, generally believed to be either Norns or Valkyries.[43] The word for heddle rod, *skilskaft*, is in this poem used in the plural *skopt* or *sköft*, indicating that the women used multiple heddle bars on a single loom.[44]

A small piece of physical evidence also exists in a loom owned by the Norse Folk Museum. Studied closely by Hoffmann, this loom was acquired from Fana, Norway. The uprights have seventeen holes each spaced closely together where heddle pegs held the heddle bars. The middle three holes placed at a convenient height for weaving have more wear, indicating the common use of multiple heddle bars.[45]

Faroese also has an idiom, 'having trouble with the middle shaft' or heddle bar, which is used to describe an argument.[46] Karen-Hanne Stærmose Nielsen writes of five Norwegian variations of heddle pegs that have notches for resting two heddle bars per peg, with styles dating from 1075 AD to 1250 AD.[47] This would only be necessary if several heddle bars were in use at the same time.

[42] Elsa E. Guðjónsson, 'Some Aspects of the Icelandic Warp-Weighted Loom, Vefstadur', *Textile History* 21.2 (1990), pp. 165-79 (p. 165).

[43] *Njal's Saga*, in *Icelandic Saga Database* <http://sagadb.org/brennu-njals_saga> [accessed 9 March 2012], chapter 157; Robert Cook, trans., *Njal's Saga* (London: Penguin Books, Ltd., 2001), pp. 303-4.

[44] Guðjónsson, Elsa E., 'Járnvarðr Yllir', p. 186.

[45] Hoffmann, *Warp-Weighted Loom*, pp. 24, 132, 134.

[46] Hald, *Ancient Danish Textiles*, p. 205.

[47] Karen-Hanne Stærmose Nielsen, *Kirkes Væv: Opstadvævens Historie og Nutidge Brug* (Lejre: Historisk-Arkæologisk Forsøgscenter Lejre, 1999), p. 93.

There is also a possible correlation between the number of heddle bars and the organization of loom weights, though this has not been explored, as the use of two lines of warp weights instead of a single line has been the accepted method of arranging the weights for modern scholars after Hoffmann's publication.[48]

A *crancstæf*, mentioned earlier, is important enough to be documented, and unhelpfully translates as 'a weaver's instrument'.[49] The term can be found in the *Gerefa*, a document in Old English, setting out the responsibilities of reeves, possibly written or compiled by Wulfstan who was Bishop of Worcester and Archbishop of York from 1002-1023 AD.[50] Many of the words relating to weaving tools appear in this document as a list of items a reeve should provide for his people, though the type of weaving technology referenced is uncertain.

The exact nature of the *crancstæf* is unknown, though Walton Rogers believes it to be a crank stick for a loom with one or more rotating beams.[51] This description certainly applies to the warp weighted loom, as the cloth beam rotates to roll woven cloth out of the working space on the loom.

There is a small, but necessary, piece of the warp weighted loom, seldom discussed, that could be the *crancstæf*. It is a specially chosen stick or spoke that is used to roll the woven cloth onto the cloth beam, and then hold the weight of the cloth and all the warp weights by being braced on a surface such as a loom upright, in order to keep the piece from unrolling so that more cloth can be woven. This stick must have a small enough diameter to fit into a hole drilled into the end of the cloth beam which in turn must be small enough to keep the structural integrity of the cloth beam intact through the stresses of being rolled. This stick or spoke must also be

[48] See the sections on warp weights and modern warp weighted weavers for more discussion.

[49] Bosworth and Toller, *Anglo-Saxon Dictionary*, p. 169.

[50] Walton Rogers, 'Old Roman Loom', p. 165.

[51] Walton Rogers, 'Old Roman Loom', p. 166.

strong enough not to snap at the pivot point and of sufficient length to reach the surface it must rest against.

The best visual evidence for the use of a crank with the warp weighted loom comes from a 1946 silent black and white film by the researcher Anna Grostøl, released online by the Norwegian Folk Museum in 2013. The weaver in Grostøl's films uses all of her strength to roll the cloth beam as the mass of the woven cloth, warp threads and loom weights must be contended with, demonstrating that the stick must be able to withstand a fair amount of stress.[52] To be able to suit all these needs, the weaver must have a carefully chosen piece of wood that is then crafted to suit the purpose.

The lack of surety from the linguistic and archaeological evidence may stem from regional dialects or temporal diversity.[53] In her study of weavers in the mid-twentieth century, Hoffmann got the feeling that there were no specific terms for parts of the loom. Words were made up at the time for the purpose of communication, which is also a possible explanation for the lack of a word in early medieval Britain.[54] None of these terms further understanding of how the warp weighted loom was assembled or provide any detail pertaining to the wood parts of the tool, therefore, research was expanded to include artistic renditions of the loom.

As noted earlier, no pictorial evidence of the warp weighted loom has been identified for Anglo-Saxon or Anglo-Viking England. To gain a more complete understanding of how the loom appeared, an examination of artworks outside of the geographical limitations and time frame of the thesis was necessary.

Looking to artwork for evidence relating to textile tools is problematic at best. Most images related to early medieval spinning and weaving only sketch out

[52] *Norwegian Folk Museum*, 'Grenevev del 3 av 3'.

[53] Hyer and Owen-Crocker, 'Woven Works', p. 169.

[54] Hoffmann, *Warp-Weighted Loom*, p. 48.

enough detail to give the suggestion of the tool or activity, possibly because such things were commonplace enough not to merit more attention by the artist. Another possible reason for the lack of detail might be the human tendency to not pay particular attention to such things unless working with them very closely. Still, as long as the limitations are recognized, art can occasionally give hints as to the nature and set up of the warp weighted loom.

The earliest image currently known with warp weighted looms in Northern Europe comes from a section of artwork from the Great Rock at Naquane in Northern Italy, dating to around the fourteenth century BC (see figure 7).[55] The Bronze Age artwork includes seven images of warp weighted looms.[56] Uprights, cloth beams, and multiple heddle bars are visible, as are stylized warp weights.

Figure 7. Three of the images of warp weighted looms from Naquane Rock 1. Image from Anati, 'Way of Life', p. 28.

More stylized images are available in the Hallstatt urn from Sopron, Hungary, dating to the first millennium BC, an Etruscan pendant from Tomba della Ori, Bologna, Italy, from the seventh century BC, and the remains of a wooden throne from Tomba del Trono, Verucchio, Italy, also from the seventh century BC

[55] Barber, *Prehistoric Textiles*, p. 91.

[56] Emmanuel Anati, 'The Way of Life Recorded in the Rock Art of Valcamonica', *Adoranten* (2008), pp. 13-35 (p. 28).

(see figure 8).[57] The image from the Hallstatt urn suggests multiple heddle bars, and several lines of warp weights, but has almost no information about the frame of the loom. Found on the body of a wealthy woman, the Etruscan pendant hints at a cloth beam and uprights, but gives no details about heddle bars or other wooden parts of the loom. Warp weighted loom images from the wooden throne are so abstract to be barely recognizable, and therefore provide no usable information, aside from the fact of their existence.

Figure 8. From left to right: The Hallstatt urn (Natural History Museum Vienna website), the Etruscan pendant (from Barber, Prehistoric Textiles, p. 269, fig. 12.2), and fragments of the wooden throne from Tomba del Trono (Natural History Museum Vienna website).

The Archaeological Museum of Ankara owns a grave marker from Nallihan, Turkey, which has not been dated more closely than attributing it to the Roman era.[58] The stele of Phrygian design commemorates a couple, with the wife's tools carved on the left side under her image (see figure 9).[59] A warp weighted loom and associated tools, including items resembling current understanding of single ended pin beaters, combs and shuttles, are in the lower corner. The uprights, cloth beam, and shed bar are easily visible. There is a suggestion of a single heddle bar, though

[57] Hoffmann, *Warp-Weighted Loom*, p. 317; Barber, *Prehistoric Textiles*, p. 56; Margarita Gleba, 'Textile Tools and Specialisation in Early Iron Age Female Burials', *Gender Identities in Italy in the First Millennium BC*, ed. by E. Herring and K. Lomas (Oxford: Archeopress, 2009), pp. 69-78 (p. 70).

[58] Michel Feugère, 'Métiers à Tisser Antiques d'Asie Mineure', *Instrumentum*, 30 (2009), pp. 22-24 (p. 23).

[59] David French, *Roman, Late Roman and Byzantine Inscriptions of Ankara: A Selection* (Ankara, Turkey: Dönmez Offset, 2003), p. 176.

this is only hinted at by a horizontal line crossing the warp threads in the middle of the loom.

Figure 9. Grave marker and close up of warp weighted loom from Nallihan, Anatolia, now in Turkey. From Feugère, p. 23 (fig. 2).[60]

Closer to the time frame and geographical space of Anglo-Saxon England is the grave marker currently housed in the Provincial Archaeological Museum of Burgos, Spain (see figure 10). It dates to between 130 and 200 AD.[61] The weaver is wielding a weaving comb and some form of pin beater or weaving sword. Even though the bottom of the stone where warp weights would be shown is missing, the cloth being woven from the top down confirms it as an image of a warp weighted loom. The uprights and cloth beam are depicted, though heddle bars are noticeably missing from the artwork.

[60] Of the many steles with warp weighted looms depicted on them from West Asia, this monument has the most detail and is the most clear. Personal communication with Michel Feugère dated 12 Sep 2013.

[61] John Peter Wild, 'The Romans in the West, 600 BC – AD 400', *The Cambridge History of Western Textiles*, vol 1, ed. David Jenkins (Cambridge: Cambridge University Press, 2003), pp. 77-93 (pp. 84-85).

Figure 10. Spanish grave marker. Photo courtesy of the curator of the online database Hispania Epigraphica.

Also from the late Roman era is the funerary monument of a woman from Baugy, France.[62] Generally thought to be a two-beamed loom over a warp weighted loom due to the positioning of the single-ended pin beater, a problematic tool in itself to be discussed later, the loom in the image is placed in such a manner that the only observable loom part is a single upright indicating that it is a vertical loom type (see figure 11). There is a hint of a cloth beam or top spacing bar, though this is not clear.

[62] Walton Rogers, *Cloth and Clothing*, p. 35.

Figure 11. Funerary monument from Baugy, France with a vertical loom on the right hand side. Image from Walton Rogers *Cloth and Clothing*, p. 35 (fig. 2.27).

In the British Isles, there is only one known image of a warp weighted loom, thought to be of Pictish manufacture, originally placed in the Kirriemur Kirk, Scotland (see figure 12). The stone dates to the ninth or tenth century AD, making it the only image within the Anglo-Saxon and Viking era currently known, though it is from a different culture and outside the geographical boundaries set by this thesis.

The stone, called 'The Priest's Stone', was first noted by John Stuart in a publication for the Spaulding Club antiquarian society in 1856. Where the stone was originally placed among the other standing stones of the area is unknown as it was used as part of the foundation for the parish church in Kirriemuir until the building was pulled down in 1787. The stone was then used as a head stone for some time.[63] It is currently housed in the Meffan Institute.[64] The loom is in the lower right section.

The frame of the loom comprising the uprights and cloth beam are sketched out as simple lines. There is a single heddle bar and a shape that might indicate a shed bar, though it does not connect with the uprights.

[63] John Stuart, *Sculptured Stones of Scotland* (Aberdeen: The Spaulding Club, 1856), p. 14-15.

[64] *Index of Christian Art* < http://ica.princeton.edu/> [visited Princeton centre1-5 May 2008].

Figure 12. Kirriemur Sculpted Stone. Image from *Royal Commission on the Ancient and Historical Monuments of Scotland*.

The next available image comes from a manuscript found in Rein, Austria, dating to 1200-1220 AD.[65] By this time, the warp weighted loom has taken a background role in cloth making, though it still seems to be in the woman's sphere in a time where task of weaving is being taken over by the guild system which primarily employed men. In the drawing, two men work at a different textile related tasks, while the woman is put off to the side, weaving on the warp weighted loom (see figure 13).

It is interesting to note the loom does not have any loom weights tied to the warp, though the upward weaving confirms it as a warp weighted loom. The warp doubles back on itself, supporting the idea that the loom could create cloth longer than the height of the loom, a distinct advantage of the warp weighted loom over other types of vertical loom. The woman is also using a weaving sword and some form of shuttle. The uprights, cloth beam, and brackets for holding the cloth beam are visible, but there are no heddle or shed bars in the image. This is the last medieval image known of the warp weighted loom.

[65] Reiner Musterbuch (ÖNB 507, fol. 2r), found at *Institute für Realienkunde* <http://tethys.imareal.oeaw.ac.at/realonline> [accessed 11 May 2013].

Figure 13. Pattern Book, Reiner Musterbuch (ÖNB 507, fol. 2r), c. 1200-1220.

More than five hundred years pass between the previous image and the next drawing of the warp weighted loom. Sæmundur Magnússon Hólm drew the Icelandic variant of the warp weighted loom for the publication of *Oeconomisk Reise igiennem de nordvestlige, nordlige Kanter af Island* by Ólafr Ólafsson in 1780 (see figure 14). Hólm saw the loom during an excursion around Iceland, at least three years before drawing the loom, by which time he may have confused or conflated certain details.[66] By this point, the loom had become a tool for weaving *wadmal* (an Anglicized version of the Icelandic word *vaðmál*), a traditional cloth made with thick yarns.[67] The drawing is the first to label the various parts of the loom and the associated tools. It is also the first image in the Northern European record to show the spokes holding the cloth beam in place, and the first since the Naquane Rock to definitively show multiple heddle bars.

[66] Hoffmann, *Warp-Weighted Loom*, p. 122.

[67] Hoffmann, *Warp-Weighted Loom*, p. 10.

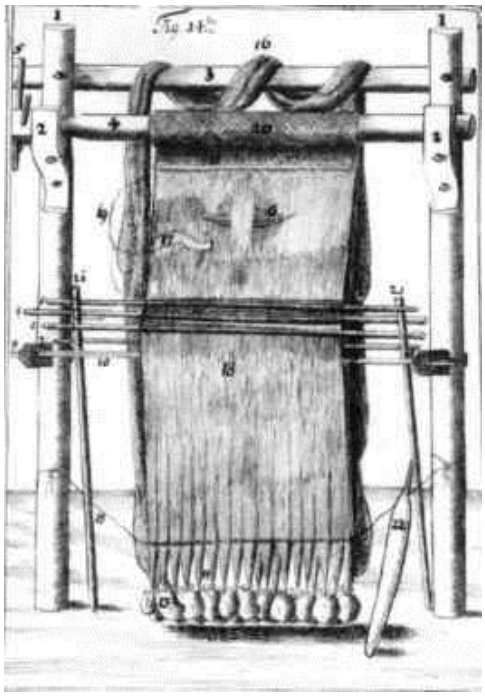

Figure 14. Original Hólm drawing, from the 1778 expedition. Image from Hoffmann, p. 116 (fig. 53).

Ólafsson made the choice to translate his work from Danish to German, also using the *non de plume* Olaus Olavius for the publication. *Oekonomische Reise durch Island in den Nordiveftlichen, und Nord-Nordiveftlichen Gegende*, was published seven years later, in 1878.[68] The drawing of the loom was reinterpreted for a different art format, creating a wood cut for the book (see figure 15). The woodcut version of the loom was published with both the Danish and the German versions of the book. Several small but significant changes occurred during the transfer from drawing to wood cut. The spokes for the cloth beam become a single spoke, the *hrœll* changes in size and curvature, and the warp weights become more numerous and smaller. The heddle bars are further down the uprights, and the weaving sword becomes longer and wider.

[68] Olaus Olavius, *Oekonomische Reise durch Island in den Nordiveftlichen, und Nord-Nordiveftlichen Gegende* (Leipzig: Breitkopfischen Buchhandlung, 1787).

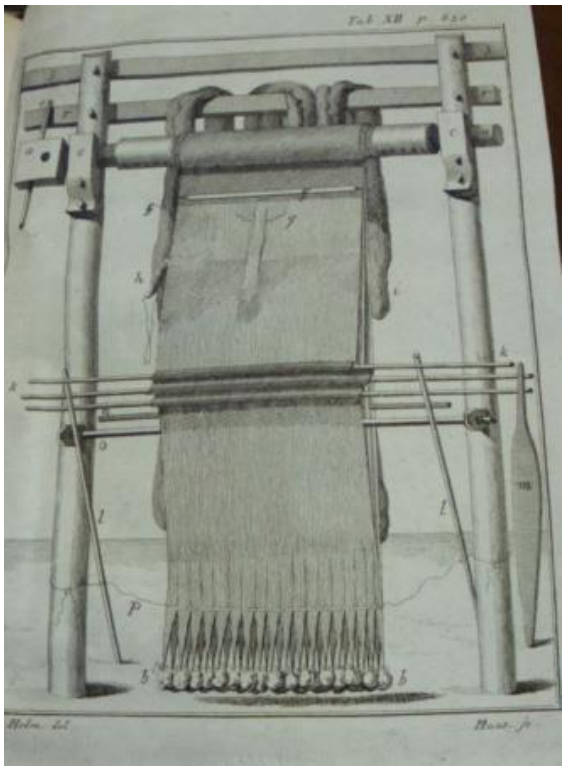

Figure 15. Woodcut variation of Hólm loom, 1787. Photograph by author from *Oekonomische Reise durch Island in den Nordiveftlichen, und Nord-Nordiveftlichen Gegende*, Table XII, held by the John Rylands Deansgate Library at the University of Manchester.

The final image of a warp weighted loom dating before the twentieth century was published in 1854 by Jens Jacob Worsaae for the collection of the Royal Museum of Antiquities in Copenhagen.[69] Unusual because it was set up with a fine linen textile on it, the loom was from the Faroe Islands.[70] The loom is drawn with a single heddle bar and a fairly sizable weaving sword. The image has a single pin beater hanging from the centre of the cloth beam. This is different from the photograph of the same loom, which has three (see figure 16).

[69] Jens Jacob Asmussen Worsaae, *Afbildniger fra Det Kongelige Museum for Nordiske Oldsager i Kjöbenhavn* (Copenhagen: Kittendorff and Aagaards, 1854), p. 123.

[70] Hoffmann, *Warp-Weighted Loom*, p. 144.

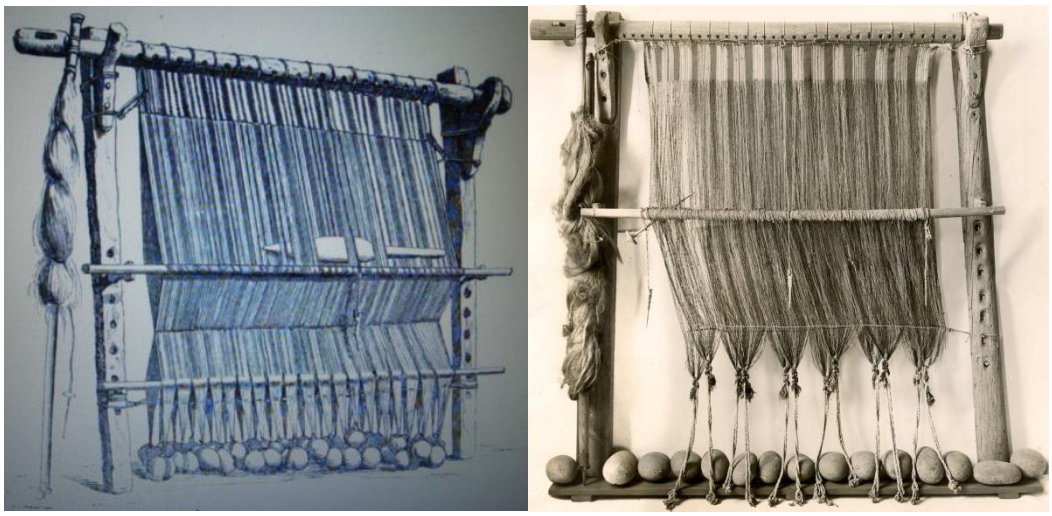

Figure 16. On the left is the Worsaae loom drawing from the loom held by the museum of Copenhagen, 1854. Image from *Afbildniger fra Det Kongelige Museum for Nordiske Oldsager i Kjöbenhavn*, p. 123. On the right is a photograph of the actual loom. Image provided by the National Museum of Denmark in Copenhagen.

Aside from a small amount of linguistic evidence and common sense, these images are the best evidence currently available for the wood parts of the early medieval warp weighted loom. More information about the loom is available through the items that do survive in the archaeology because they are made of stone, clay, and bone.

2.2. Warp Weights

There is one incontestable component of the loom which survived in England from the time of the Anglo-Saxons: the weights that differentiate this loom type from other primitive looms and give the loom its name. Loom weights are first identified as such in English in print in 1881, though it has long been known that the primary use of these artefacts was weaving.[71]

Warp weights, also called loom weights, are the best indicators that a loom existed in an archaeological context. Unfortunately for the study of the uses and

[71] A. L. Fox, 'Excavations at Mount Cabourn, Sussex', *Archaeologia* 46 (1881), pp. 468-493 (p. 493).

capabilities of the warp weighted loom, the weights are often found as single artefacts, not in groupings large enough to indicate the presence of a loom or storage of the weights.[72] Most of the weights found by archaeologists are those that have been discarded or reused for other purposes.[73]

Another difficulty loom weights present in archaeology is the variety of sizes, shapes, and materials used to tension the warp over the extensive time frame and large geographic area in which the loom was used. Since weights are known to have been made from collections of similarly sized river rocks, unfired clay, and possibly bags of pebbles or sand, it is likely that many items used as loom weights have either gone unidentified, or returned to the dust from which they were made.[74] Weights are known to have changed in mass or returned to their component parts while in archival storage.[75]

Although weights were made of many different materials, there seems to be some degree of local preference. Soapstone was a popular material in Norway.[76] Occasionally, the weights would be made of rim sherds from broken vessels made of this easily worked rock.[77] The use of soapstone was commonplace enough that the Norwegian word for soapstone, *kljåstein*, is the same as the word for warp weight.[78]

[72] Ingrid Schierer, 'Experiments with Weaving and Weaving Tools: Basic Considerations After 20 Years of Work', *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles*, ed. by Peter Bichler, Karina Grömer, Regina Hofmann-de Keijzer, Anton Kern and Hans Reschreiter, British Archaeological Reports International Series 1351 (Oxford: Archaeopress, 2005), pp. 97-100 (p. 98).

[73] Andersson, *Birka and Hedeby*, p. 34.

[74] Andersson, *Birka and Hedeby*, p. 34.

[75] Brendan Burke, 'The Kingdom of Midas and Cloth Production', *Ancient Textiles*, eds. Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), pp. 64-70 (p. 68).

[76] Eva B. Andersson, 'Textile Tools and Production during the Viking Age', in *Ancient Textiles* ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), pp.17-25 (p. 28).

[77] Østergård, *Woven into the Earth*, p. 55.

[78] Hoffmann, *Warp-Weighted Loom*, pp. 21, 419; Østergård, *Woven into the Earth*, p. 55.

Basalt was a common material for the weights in the Faroe Islands. Granite was preferred in Gardar, Greenland.[79] Instead of drilling a hole through the hard rock to tie a cord through for hanging the weight on the warp, these weavers tied ribbons around each weight to attach it to the warp. The unidentified Norwegian weaver filmed in 1947 by Anna Grostøl gathered carefully selected rocks from the beach and wrapped the warp directly around the rock, tying it in such a manner that releasing the knot caused the warp to slide off while still staying in an ordered fashion.[80]

In Britain from 450-1100 AD, weavers made loom weights from what was available in the surrounding countryside.[81] Warp weights found at Flixborough, Lincolnshire, were made from local clay, as were those from Mucking, Essex, and the Coppergate excavation in York.[82]

Because the weights crash together during the course of weaving, they would often become damaged and need replacing, especially if unfired as dry clay is particularly fragile.[83] Considering the large number of weights necessary to clothe an entire community (the Flixborough site, with forty uncovered structures, yielded seven hundred fifty six whole specimens and unnumbered fragments, for example), and the 'found item' nature of the object, spending time and energy trading from

[79] Østergård, *Woven into the Earth*, p. 55.

[80] *Norwegian Folk Museum*, 'Grenevev del 1 av 3 – Kautokeino 1955' <http://www.youtube.com/watch?v=XUm2JvsLzx8> [accessed 8 Mar 2013]; 'Grenevev del 3 av 3.

[81] Walton Rogers, *Cloth and Clothing*, p. 30.

[82] Penelope Walton Rogers, 'The Importance and Organization of Textile Production', in Christopher Loveluck, *Rural Settlement, Lifestyles and Social Change in the Later First Millennium AD: Anglo-Saxon Flixborough in its Wider Context*, Excavations at Flixborough 4 (Oxford: Oxbow Books, 2007), pp. 106-112 (p. 107); Helena Hamerow, *Excavations at Mucking: Volume 2, the Anglo-Saxon Settlement, Excavations by M. U. Jones and W. T. Jones* (London: English Heritage/British Museum Press, 1993), p. 17; Penelope Walton Rogers, *Textile Production at 16-22 Coppergate,* The Archaeology of York: The Small Finds 17.11, ed. by P. V. Addyman (Dorchester: Dorset Press, 1997), pp. 1687-1784 (p. 1753).

[83] The modern warp weighted weaver Anna Nørgård reported as much as twenty five percent of a weight was lost when weaving with unfired weights. From a paper given at a symposium for the Medieval Dress and Textile Society on 5 Mar 2011.

distances for the materials or finished item would be unnecessarily expensive.[84] Complete sets could weigh as more than twenty five kilograms, making it an inefficient use of transportation, energy and space for an item that was of no particular value of itself.[85] Instead, the required weights were manufactured locally, as needed.[86]

Due to the ease of replacement and the inexpensive materials used in creation, warp weights seem to have no intrinsic value for Anglo-Saxon or Viking era weavers, except in their use as tools necessary for weaving.[87] Though other textile processing equipment has been found in women's burials in Britain, warp weights as symbols or functioning as weaving tools have never been among them.[88] In the only known examples of warp weights in graves, four fired pyramid-shaped weights were found in the excavation of St Peter's Church in Barton-on-Humber, repurposed as head supports with no apparent symbolic intention, for Anglo-Saxon female graves.[89]

Nor do they have much value to modern researchers outside of the limited area of textile studies. Marta Hoffmann explains, 'Loom weights are not among the objects of great interest to the archaeologist; there are far too many of them and, as their form changed little through a very long period of time, they are of little use in

[84] D. H. Evans and Christopher Loveluck, eds., *Life and Economy at Early Medieval Flixborough, c.600-1000; the Artefact Evidence*, (Oxford: Oxbow Books, 2009), p. xiii; Penelope Walton Rogers, 'Textile Production', in *Life and Economy at Early Medieval Flixborough, c.600-1000; the Artefact Evidence*, ed. by D. H. Evans and Christopher Loveluck (Oxford: Oxbow Books, 2009), pp. 281-316 (p. 282).

[85] Walton Rogers, *Cloth and Clothing*, p. 32.

[86] Barber, *Prehistoric Textiles*, p. 299.

[87] Barber, *Prehistoric Textiles*, p. 299. In twentieth century Norway, loom weights were kept in the outhouse. Rogers, *Cloth and Clothing*, p. 63. Considering warp weights have been found in rubbish heaps, walk ways, and barn settings throughout the history of the tool, this is a safe assumption.

[88] Andersson, 'Birka and Hedeby', p. 83.

[89] Susan M. Youngs, John Clark and T. B. Barry, 'Medieval Britain and Ireland in 1982', *Medieval Archaeology* 27 (1983), pp. 161-229 (p. 185).

dating finds'.[90] This complicates the study of warp weighted weaving because no large scale organized survey of loom weights has been completed as of the time of this writing. Those studies that do exist cover geographically limited areas and/or specific archaeological sites, often comparing site information with equally limited information from a few well known site reports from completely different geographic and historic contexts.

Karen-Hanne Stærmose Nielsen in her work titled 'A Preliminary Classification of Shapes of Loomweights' also acknowledges that no encyclopaedic study exists for Northern Europe. But she believes there is enough evidence to consider a classification system to assist with the study of loom weights, based on five components: material, such as stone, clay (fired or unfired), or metals; dimensions of the individual weight; net weight; who produced the loom weight; and whether it was a trade item, even if only traded in shape and size of the weight.[91] She further delineates the shapes of the weights into the categories of ball, dome, cone shaped, pyramid, slab, and lens, with the doughnut shaped weights traditional to the Viking and Anglo-Saxon period under the classification of ball shaped weights. The warp weights she discusses vary from two hundred grams to four thousand grams, though most weighed between three hundred and one thousand two hundred grams. Her six page article crosses all European historical eras that used the warp weighted loom as a weaving technology.[92]

[90] Hoffmann, *Warp-Weighted Loom*, p. 17.

[91] Karen-Hanne Stærmose Nielsen, 'A Preliminary Classification of Shapes of Loomweights', *Northern Archaeological Textiles: NESAT VII*, ed. by Frances Pritchard and John Peter Wild (Oxford: Oxbow Books, 2005), pp. 129-135 (p.129).

[92] Nielsen, 'Loomweights', pp.130-33.

Figure 17. Three Anglo-Saxon era loom weights on display at the Higgans Art Gallery and Museum, Bedford, Befordshire. From left to right: Intermediate, Annular and Bun-Shaped forms. Photograph by Simon Speed.

Penelope Walton Rogers separates Anglo-Saxon era weights in English contexts into three primary classifications: annular, with a hole wider than the clay ring; intermediate, with a hole the same width as the ring; and bun shaped, with a hole in the weight smaller than the ring (see figure 17). Early medieval English weights usually fall within the 150 to 500 gram range in mass.[93] In her study of the textile tools excavated from the village of Flixborough, an area with a great deal of cloth production occurring between the eighth and early eleventh centuries, Walton Rogers connects loom weight size and shape from the village to excavations in Sweden, and a common weaving tradition between Anglo-Saxon England, Saxony and Frisia.[94]

Walton Rogers also believes the Anglo-Saxon loom weight shape came to Britain from Saxony. Circular weights appear at Feddersen Wierde, a Saxon site in the marshy coastland of Northern Germany, in the latter part of the Roman Iron Age. She argues that the round shape replaces the previous triangular and pyramidal loom

[93] Walton Rogers, *Life and Economy*, p. 288.

[94] Walton Rogers, *Rural Settlement*, p. 109.

weights used in that part of Germany and in Antiquity, by which she presumably means Classical era Greece and Rome.[95]

She also states the earliest annular weights on British soil were located in the Roman Saxon Shore fort at Portchester, Hampshire. However, examination of the initial reports of the excavation of Portchester shows only a single warp weight fragment was documented, noting that it had finger markings from the creation process. There was no reference to dating or location within the site.[96] It is also difficult to accept a single fragment as conclusive evidence of the arrival of a particular weight shape to England without other examples.

By the end of the fifth and early sixth centuries, according to Walton Roger's published theory, these types of weights were used in almost all of the southern and eastern counties of England. The first use of the intermediate class of circular weights can be traced to Mucking in the sixth century, and by the end of the seventh century this type had gained preference throughout much of the Anglo-Saxon areas of settlement. By the end of the eighth century, the bun shaped loom weight had replaced the intermediate loom weight.[97] Without a published survey of English warp weighted weaving tools, this theory is difficult to verify.

With no survey study yet completed, it cannot be known how well this suggested spread of weight design conforms to available data and should only be taken as a very general guideline. Hoffmann reports that several scholars have attempted to organize weights chronologically based on shape, but that the approach seems to function only on a local level.[98] In Flixborough, both intermediate and bun

[95] Walton Rogers, *Cloth and Clothing*, p. 30.

[96] Barry Cunliffe and David Baker, 'Excavations at Portchester Castle, Hants, 1969-1971: Fourth Interim Report', *The Antiquaries Journal* 52.1 (1972), pp. 70-83, 221-222.

[97] Walton Rogers, *Cloth and Clothing*, p. 30.

[98] Hoffmann, *Warp-Weighted Loom*, p. 20.

shaped weights existed together throughout all phases of settlement.[99] Walton Rogers finds a closer relationship between the shape of the weight and the total mass than shape and dating of warp weights.[100]

As well as being made primarily of local clay, most Anglo-Saxon and Viking era weights were likely made by or at the request of the weavers themselves.[101] Because of the simple shape, and lack of refined techniques involved, the task of weight creation could as easily have been assigned to a child with enough manual dexterity. Provided the amount of clay was closely approximated, the shape did not need to be exact or balanced, as can be observed by the number of different shapes and materials used as warp weights.

Generally, Anglo-Saxon weights were made by moulding a flat circular section of clay, then pushing a stick through the centre, which leaves a slight lip of clay around the hole.[102] Sometimes a groove was created for the placement of the cord to hang the weight from groups of warp threads. Sixty three weights found in Flixborough had makers' marks that could be identifiers of the workshop or creator, or perhaps were intended to indicate the mass of the weight.[103] The shaped clay was left to dry; sometimes the weight was fired and sometimes left unfired. Two groups of unfired weights were found in Old Erringham, West Sussex.[104] Grimstone End,

[99] Walton Rogers, *Life and Economy*, p. 288.

[100] Walton Rogers, *Life and Economy*, p. 288.

[101] John Collis, *Winchester Excavations, Vol II: 1949-1960* (Hertford: Stephen Austin and Sons, Ltd., 1978), pp. 33-34, 38.

[102] Walton Rogers, *Life and Economy*, p. 288.

[103] Walton Rogers, *Life and Economy*, p. 288. Old Town Olso, Norway, settled around AD 1000, produced warp weights impressed with crosses or runes presumably for avoiding evil, men's names, and other marks. It is possible this is a tradition practiced in Britain in Viking settled areas, though there is not yet documented evidence. Østergård, *Woven into the Earth*, p. 55.

[104] D. M. Wilson and D. G. Hurst, 'Medieval Britain in 1964', *Medieval Archaeology* 9 (1965), 170-220 (p. 175).

Packenham, Suffolk, Upton, and the site at Winchester also had unfired weights.[105] Baked weights were found in Mucking, West Stow, the York find at Coppergate and West Heslerton.[106]

Eriswell, Suffolk, demonstrated evidence for weight creation in a burned down pit hut. The site included unworked clay and worked clay with half-finished perforations, as well as finished weights. The Flixborough site had pieces of unworked clay in a deposit next to some evenly fired weights and a bone tool identified as a 'pin beater', which may have been used to make the holes in the clay.[107] One hundred and forty unbaked weights were found in nine irregular rows in Mucking, possibly being stored or drying for firing or use. A collection of weights in shorter, closer rows found at Upton, Northamptonshire had a wooden bar passed through them, likely a version of a drying rack.[108]

It is more likely that the weights in these instances were set out to dry as part of the creation process, rather than being in some sort of storage. The time and space it would take to string individual weights onto a pole, and then to remove them before use seems unlikely given the inexpensive materials, simplicity of creation and ease of replacement. Concern for damage would be unlikely as the repeated crashing of the weights against each other during the weaving process is as likely to crack or break a weight as tossing it into a pile or basket. Locating and preparing a strong enough stick to hold up to the stresses of carrying the mass of unused weights would take time, and such an item could be put to other, perhaps better, uses. Piles of spare

[105] R. M. Entwistle and J. Pearson, 'The Conservation of 63 Anglo-Saxon Loom-weights', *The Conservator* 20.1 (1996), p. 37; D. A. Jackson, D. W. Harding and J. N. L. Myres, 'The Iron Age and Anglo-Saxon Site at Upton, Northants', *The Antiquaries Journal 49.2* (1969), pp. 202-221 (p. 210); Collis, *Winchester Excavations*, p. 29.

[106] Hamerow, *Excavations at Mucking*, p. 66; West, 'West Stow', p. 138; Walton Rogers, *Textile Production at 16-22 Coppergate*, p. 1753; 'The West Heslerton Assesment', *Internet Archaeology* < http://intarch.ac.uk/journal/issue5/westhes/3-6-2.htm > 3.6.2.4 Function of Grubenhäuser [accessed 7 March 2014].

[107] Walton Rogers, *Flixborough*, p. 106.

[108] Jackson, Harding and Myers, 'The Iron Age and Anglo-Saxon Site at Upton', p. 210.

weights kept near the lines of weight indicating working looms in Upton and Sparkford provide evidence for the practice of piling weights for storage.[109]

When warp weights are found in lines it almost certainly indicates the presence of a loom with weaving in progress. Many Anglo-Saxon archaeological sites have brought to light lines of weights in both single and double rows that indicate looms abandoned with weaving still in progress.[110] In one example, weights found at Grimstone End, Suffolk, dating to the seventh century, fell in two distinct lines.[111] The spacing of the weights allowed them to fall over, exposing the centre hole. An image of the weights, also from a seventh century find, in Dover clearly demonstrates a single line of weights (see figure 18).[112] The weights in a single line tend to be close together, not allowing the weights to tip over, though this observation is a generalization, and may not always hold true, depending on the needs of the weaver. If the weaver has many light weights at hand, she may attach those weights to fewer threads to achieve the desired tension rather than take the time to create the heavier weights to achieve the same tension with fewer objects. The mass and size of the weights as well as the tension on the warp threads desired by the weaver will affect the spacing of the weights on the loom more often than the number of warp threads.

[109] Jackson, Harding and Myers, 'The Iron Age and Anglo-Saxon Site at Upton', p. 210.

[110] Philippa A. Henry, 'Who Produced the Textiles? Changing Gender Roles in Late Saxon Textile Production: the Archaeological and Documentary Evidence', *Northern Archaeological Textiles, NESAT VII, Textile Symposium in Edinburgh, 5th-7th May 1999,* ed. by Frances Prichard and John Peter Wild (Oxford: Oxbow Books, 2005), pp. 1-57 (p. 51).

[111] Entwistle and Pearson, 'The Conservation of 63 Anglo-Saxon Loom-weights', p. 37.

[112] Hoffmann, *Warp-Weighted Loom*, p. 312.

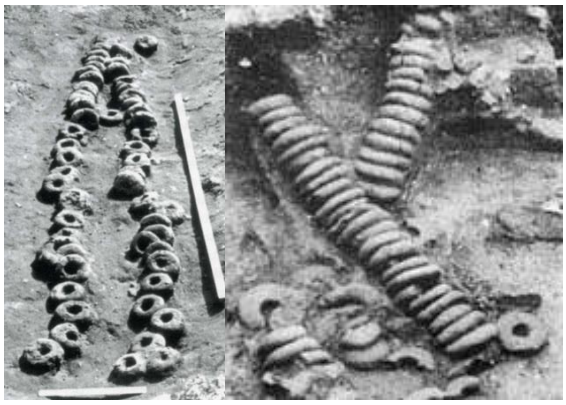

Figure 18. The image on the left shows two rows of weights from Suffolk spaced far enough apart to fall over. The image on the right shows the remains of several Saxon looms from Dover, in a single line with the weights close enough together to stay upright.

The difference in weight arrangement does not seem to be cultural or limited to a specific area. Double lines of weights take advantage of the natural shed provided by the loom which is very useful for tabby, or other balanced weaves.[113] More complicated weave patterns such as a diamond twill, a preferred Anglo-Saxon weave pattern often found by archaeologists, can be more easily woven with a single line of weights.[114] The 2/1 twill, a weave that requires three different sheds, does not work well with two lines of warp weights leading academics to believe that the pattern would be difficult, if not impossible to weave on a warp weighted loom.[115] Experimentation proves that such a weave, known to Anglo-Saxon England, is possible on a warp weighted loom. On a warped loom using a single line of weights, the weights all swing forward at the same time when a heddle bar is moved, keeping an even tension on all the warp threads.[116]

[113] A natural shed is created as half the warp threads are angled forward by draping the threads over the lower shed bar, which opens a space for the weft thread.

[114] Walton Rogers, Penelope, 'Old Roman Loom', p. 161.

[115] Maria Amelia FitzGerald, 'Textile Production in Prehistoric and Early Medieval Ireland', 5 vols., (unpublished doctoral thesis, Manchester Metropolitan University, 2000), p. 135; Hyer and Owen-Crocker, 'Woven Works', 157-184 (p. 167); Leahy, *Anglo-Saxon Crafts*, p. 72; Walton Rogers, 'Old Roman Loom' p. 163.

[116] Schierer, 'Experiments with the Warp-Weighted Loom', p. 104. The viability of a single line of warp weights for more complicated weaving patterns was also proved with experimentation by the author.

With the need for a shed bar removed with the single line of weights, a warp weighted loom also does not need to be placed on slant to create the natural shed, though that is a viable, proved solution. The loom would still require some stabilization, however, and it may be that the solution for some weavers on some occasions was to plant the uprights vertically into the floor of the room. This would explain the freestanding post holes found at Mucking, Bourton-on-the-Water and Hamwic in Winchester.[117] Such an arrangement would not need a wall or beam to support a slanted loom, so a fully upright loom may be set anywhere in a room to take advantage of the best light.

Sunken Featured Building 15 from West Stow produced both single and double lines of weights within the same archaeological context, suggesting the choice of spacing has more to do with the pattern woven over cultural preferences, though the choices of the individual weaver is also a consideration (see figure 19). Single lines of weights were also found in positions not necessarily corresponding to a wall, hinting at the possibility that the loom uprights were not slanted to create a natural shed. The building burned down sometime in the late sixth or early seventh centuries, depositing weights roughly in the positions they held on the looms.[118]

[117] Phil Andrews, ed., *Excavations at Hamwic, vol. 2: Excavations at Six Dials,* (York, Council for British Archaeology 109, 1997), p. 238; Collis, *Winchester Excavations*, p. 29; Hamerow, *Excavations at Mucking*, p. 17; Leahy, *Anglo-Saxon Crafts*, p. 68; Wilson, *The Archaeology of Anglo-Saxon England*, p. 76.

[118] Walton Rogers, *Cloth and Clothing*, pp. 30-31.

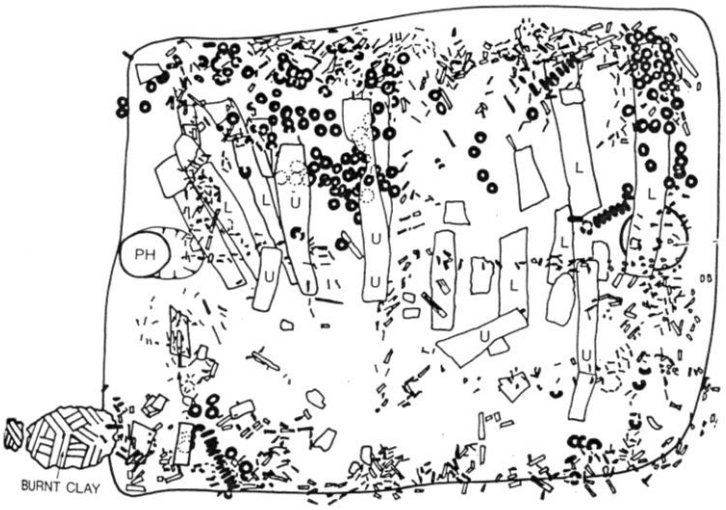

Figure 19. Drawing of SFB 15 at West Stow from *Cloth and Clothing in Early Anglo-Saxon England* by Penelope Walton Rogers, p. 31. Used with permission of the author.

Single lines of weights are easily noticed in the lower left, mid and upper right sections of the diagram. A double line of weights is found in the upper left corner, spaced far enough apart that the weights had fallen over. Weights in the upper right section are believed by Walton Rogers to have fallen from an upper storey, making it difficult to determine whether there was a loom or if the weights were set out for drying.[119] Stanley West believes the looms and stacks of weights were set up on suspended floors.[120]

The number of weights connected to the loom would depend partly on the width of the fabric being woven, so the single line of weights from the mid right section of the West Stow diagram may have been set up to weave a narrow textile such as a sleeve, or a pillow.[121] Longer lines of weights, from three separate lines of weights measuring around a metre at Dover, to up two and a half metres at

[119] Walton Rogers, *Cloth and Clothing*, p. 31.

[120] West, 'West Stow', p. 138.

[121] Barber, *Prehistoric Textiles*, p. 104.

Grimstone End, Suffolk, have also been found.[122] Cloth for mattresses, sheets, wide blankets, or a valuable sail cloth could have been in progress on these looms. Considering the amount of time and energy expended to make a piece of cloth, little of either would be wasted. Cloth would likely be woven specifically for the intended end use as well as for trade.

It should be noted that the length of a line of weights is not necessarily a good indicator for the width of the loom. A project that required a fabric of smaller width could easily be worked on a large loom by simply not using the entire cloth beam. As long as the warp thread was properly tensioned and balanced along the loom, creating an individual loom for each of the various widths of cloth desired would be a waste of resources.

The number of weights tied to the warp of each piece would have been dependent on the preference of the weaver. More warp threads attached to each weight would create less tension, and fewer warp threads would create more tension.[123] A weaver could adjust the number of warp threads attached to each weight depending on the mass of the individual weight. Because tensioning the warp weighted loom is more intuitive than scientific, it is possible that a weaver could have chosen weights of different sizes, shapes and mass for a single piece.[124]

Many factors are involved in determining the amount of warp tension desired by each individual weaver. Thread or yarn is affected by parameters including the type of fibre spun, the local humidity, the amount of twist of the yarn, the thickness of the warp thread, growth conditions of the fibre, how much light will be available where the loom is located, how long the piece is expected to be on the loom, and

[122] Philp, *Anglo-Saxon Dover*, p. 24; Walton Rogers, *Cloth and Clothing*, p. 32.

[123] Østergård, *Woven into the Earth*, p. 55.

[124] Penelope Walton, 'A Tangled Web', *Bulletin of York Archaeological Trust* 13.3 (1998), pp. 32-37 (p. 37).

most importantly, the intended finished product. Wool has slightly elastic properties where silk and linen do not, altering the tension requirements of the thread from each type of fibre. Weaving in a humid environment straightens the thread slightly and affects the smoothness of the yarn. The more twist a yarn has the stronger it is, but too much twist will cause the yarn to knot and kink, not allowing the fabric to lay flat. Too much twist can be dealt with during weaving using heavier weights, if it suits the purpose of the weaver. Thicker threads will hold more weight without breaking than the same number of thinner threads. If the sheep growing the wool were ill at any time before shearing, the fibres become weak, breaking while under tension. The longer an unfinished piece of cloth is on the loom, the more stress the warp threads undergo, and so forth.

Often the weaver takes these factors into account when working with the yarns and the loom without being consciously aware of the nuances during the decision process, making choices based on experience, muscle memory, and the physical sensation of weaving. However, an evenly distributed selection of weights allows for a more evenly spaced warp, which can affect the finished cloth.[125] A good example of an Anglo-Saxon weaver being aware of this is the set of weights with equal mass found in a sixth century layer of excavation in Upton.[126]

The logical expectation is that the mass of the warp weights would affect the thickness of the cloth: a lighter set of weights would produce lighter cloth, and heavier weights create thicker cloth. Weights at Flixborough measured around two hundred grams each, leading Walton Rogers to believe relatively fine textiles were produced there.[127] However, heavier weights did not necessarily indicate a heavier

[125] Andersson, 'Tools for Textile Production', p. 34.

[126] Jackson, Harding and Myers, 'The Iron Age and Anglo-Saxon Site at Upton', p. 210.

[127] Walton Rogers, *Cloth and Clothing*, p. 31.

piece of cloth made with thick yarns. According to Hoffmann, the water worn stones from the Faroe Islands loom in the museum at Copenhagen are the heaviest ever recorded, being between three and four kilograms each, yet fine linen has been woven with them.[128] Anglo-Saxon loom weights from the early years of the time period weighed around two kilograms, though weights between 600 and 1000 grams was more common.[129] The decisions of the weaver, such as the number of weights to use or weight shape and size, and the tensile strength of the warp threads prove to be far more important in the finished product than the weights themselves.[130]

In Anglo-Saxon and Viking era England, warp weights start disappearing from the archaeological record around the year 900 AD. It has been believed that the weaving technology of the warp weighted loom first started being replaced in larger towns and cities such as York and Winchester.[131] However, since loom weights from Winchester have been found that may date to the twelfth century, this assumption needs re-examination.[132] Once again, the lack of any systematic study inhibits a reasonable understanding of the replacement of the warp weighted loom with other weaving technologies.

The replacement weaving technology, thought to be the two beamed loom, is believed to have spread slowly from population centres to outlying villages and hamlets. Sparkford, a small hamlet in Somerset, continued to use the warp weighted

[128] Hoffmann, *Warp-Weighted Loom*, p. 21.

[129] H. Ling Roth, *Ancient Egyptian and Greek Looms* (Halifax, UK: Bankfield Museum, 1913), p. 38.

[130] Experimentation proved this point. When the hand spun warp threads of the piece being woven by the author started breaking with inconvenient frequency, one third of the 250 gram weights were removed from the warp. The threads were reattached to the weights in groups of 15 instead of 10. Working tension did not noticeably change, though the threads did not stretch as far as they had previously, shortening by about two and a half centimetres. Breakage of warp threads reduced dramatically, however, demonstrating reduced stress on individual threads.

[131] Walton Rogers, *Life and Economy*, p. 296.

[132] Collis, *Winchester Excavations*, p. 39.

loom, as demonstrated by warp weights finds, until the eleventh century.[133] However, the textile centre of Flixborough also used the warp weighted loom into the eleventh century, undercutting this assumption.[134]

2.3. Weaving Tablets

One challenge confronted by weavers using primitive looms is keeping the warp threads spaced evenly so that a balanced weave may be accomplished. Some of the available techniques include a few centimetres of closely packed tabby weave, or several rows of two separate threads making 'figure eights' around the warp threads to keep them separate.[135] Basket weave also is thought to reinforce selvedges for cloth made on the warp weighted loom.[136]

For the warp weighted loom, keeping appropriate spacing is also known to be done by the use of another primitive weaving technology: tablet weaving. Tablet weaving is also the only type of spacing or border making technique that leaves behind archaeological evidence, as most other forms of borders only require yarn and the expertise of the weaver, not other tools.[137]

[133] Walton Rogers, *Life and Economy*, p. 296; Hoffmann, *Warp-Weighted Loom*, pp. 128, 153.

[134] Walton Rogers, *Rural Settlement*, p. 106.

[135] Hoffmann, *Warp-Weighted Loom*, p. 165.

[136] Barber, *Prehistoric Textiles*, p. 165.

[137] Hoffmann, *Warp-Weighted Loom*, p. 165.

Figure 20. A warp weighted loom photographed by Frederick W. W. Howell, c. 1900.

Tablet woven borders were not always considered to be the common warp spacing technique of the warp weighted loom, as is evidenced by the photograph taken by renowned photographer Frederick W. W. Howell around 1900 AD (see fig. 20). The solution to warp spacing for the loom in the photograph is novel, if not accurate to our current understanding. Using a tablet woven border as a preferred method of controlling warp spacing likely came into the literature on the loom with the studies of Marta Hoffmann, becoming an entrenched idea due to the documentation of weavers practicing that technique. Other known types of woven borders and warp spacing techniques do not have such a concrete link in the history of the loom.

Evidence of tablet woven borders coincides with evidence of the loom, starting in Hungary before 5000 BCE, continuing wherever the warp weighted loom was used until the modern weavers documented by Hoffmann and Grostøl.[138] Tablet

[138] Barber, *Prehistoric Textiles*, p. 213.

woven borders have been noted in fabrics from Gloucester, Blewburton Hill, Armoy, Tegle, and Thorsbjerg.[139]

Figure 21. Different types of weaving tablets. Artefacts owned by the National Museum of Scotland.

It should be noted that while tablet weaving is well represented in Anglo-Saxon archaeological textiles, only two pieces of evidence from England during that era indicate the tablet weave was part of the fabric of the garment and not attached later: finds from Gloucester and Blewburton Hill.[140] Though these textiles were likely woven on warp weighted looms, and it is possible they are evidence starting borders, there is no definitive way to determine whether the tablet weaves were starting borders rather than selvedges or finishing borders, or even that this was a preferred early medieval method for spacing warp.[141]

Tablet weaving consists of a 'loom' made up of a set of cards, also called tablets, with holes in the corners to control and manipulate the yarns. Square and triangular tablets are known throughout Iron Age Britain, though square tablets are

[139] Hedges, 'The Textiles and Textile Equipment', p. 191; Audrey S. Henshall, 'Textiles on the Back of a Brooch from Blewburton Hill, Berks.' from A. E. P. Collins and F. J. Collins, 'Excavations on Blewburton Hill, 1953', Berkshire Archaeological Journal 57 (1959), 68-71 (p. 70); Henshall, 'Prehistoric Britain', p. 135; Hoffmann, *Warp-Weighted Loom*, pp. 164, 165.

[140] Coatsworth and Owen-Crocker, *Medieval Textiles*, p. 5; Hedges, 'The Textiles and Textile Equipment', p. 191; Henshall, 'Textiles on the Back of a Brooch', p. 70.

[141] Hoffmann, *Warp-Weighted Loom*, pp. 32, 128, 171.

more common (see figure 21).[142] The set of threads can have one end tied to a tree or post, and the other secured to the weaver to control the tension.[143]

Though working tablet weaving is traditionally done horizontally, it is also possible to hang one end of the tablet weave from a beam, such as the cloth beam of the warp weighted loom, and hang weights at the other end to keep tension for weaving.[144]

The practice of hanging tablet weaving from the loom is attested to by the tablet woven borders on three sides of a textile such as the fabric from the Damendorf, Germany bog find, and the Thorsbjerg cape from Denmark dating from the sixth to seventh centuries making it contemporary to Anglo-Saxon England.[145] Tablet woven borders and selvedges as part of the cloth could only have happened if the selvedge edges were being woven with cards at the same time as the rest of the fabric.[146] It is possible that warp weights were occasionally used to keep border tablet weaving under tension while the weaving was in process.[147] Such weights, if they existed, may have been smaller in size or mass than the weights used for general weaving.[148]

[142] Penelope Walton Rogers, 'The Sword-Beater', *The Anglian Helmet from 16-22 Coppergate*, The Archaeology of York: The Small Finds 17.8, ed. by D. Tweddle (York: Council for British Archaeology, 1992), pp. 882-888 (p. 35); Penelope Walton Rogers, 'The Anglo-Saxons and Vikings in Britain, AD 450-1050', *The Cambridge History of Western Textiles*, vol 1, ed. David Jenkins, (Cambridge: Cambridge University Press, 2003), p. 126.

[143] Walton Rogers, *Cloth and Clothing*, p. 35.

[144] Walton Rogers, 'Sword-Beater', p. 35.

[145] Hoffmann, *Warp-Weighted Loom*, p. 137. An image of the textile can be found in Margrethe Hald, *Olddanske Tekstiler: Komparative Textil- of Dragthistoriske Studier paa Grundlag af Mosefund og Gravfund fra Jernalderen* (Copenhagen: Glydendalske, 1950), p. 69.

[146] Hoffmann, *Warp-Weighted Loom*, p. 166.

[147] Eva Andersson, 'Tools for Textile Production from Birka and Hedeby', eds., Bjorn Ambrosiani and Helen Clarke, *Birka Studies* vol 8 (Stockholm: Birka Project, 2003), p. 31.

[148] Barber, *Prehistoric Textiles*, p. 118.

The tablets, also called cards, are stacked faces together in packs, then rotated forward or back singly or in groups to create a pattern. After each rotation which twists the threads of a single tablet together, a weft thread is placed in the shed created by the distance between holes in the tablet to secure the twist. After a weft is placed and the shed is changed, the weft thread is pulled tightly, creating a warp faced fabric.[149] Tablet weaving, therefore, is both a braid, the twisting of yarns over each other, and a type of weaving, a crossing of threads at ninety degree angles to create a cloth.

Figure 22. Close up of tablet weaving from Etruscan pendant. See figure 8 for entire image.

The majority of archaeological weaving card artefacts come from Viking Era Scandinavian sites such as Birka, Björkö and Lund.[150] The most well-known set of weaving tablets comes from the singular find with Oseberg ship burial, dating to the late eighth or early ninth century (see figure 23). Along with other textile tools, fifty two wooden tablets survived as well as the cloth band in process of being woven. Unfortunately, although threads were found interlaced in the cards, the textile evidence was too degraded to determine a pattern.[151]

[149] Candace Crockett, *Card Weaving* (Loveland, Colorado: Interweave Press, 1991), p. 9.

[150] Barber, *Prehistoric Textiles*, p. 119.

[151] Arne Emil Christensen and Margareta Nockert, *Osebergfunnet: Bind IV:Tekstilene* (Oslo: Utgitt av Kulturhistorisk Museum, 2006), p. 144.

Figure 23. Image on the left shows Oseberg tablets as found in 1904. Photograph by G. Gustofsson. Image on the right shows the cards as currently displayed in the Oseberg ship museum. Photograph by Stephen Law.

It is likely that wood was a preferred medium for weaving tablets in Britain, though very few have been found. Bone examples indicate what wood versions of a tool may have been.[152] Known bone examples come from as early as Roman London, where a single square tablet was found in Fenchurch Street dating to sometime between 50 and 70 AD. Two rare examples of triangular bone cards were also found in the Bank of England site, also in London.[153] Other contemporary examples have been located in the Walbrook Valley and 15-35 Copthall sites.[154] Outside of the London area, bone weaving tablets can be found scattered around Britain south of Hadrian's Wall.[155]

Within Anglo-Saxon and Viking era England tablets have been found in York, West Heslerton, and in a woman's burial in Kingston Down, Kent.[156] The York tablet is a slightly smaller than typical example, being only two and a half centimetres along a side, compared to the average example measuring thirty to forty millimetres a side. It has been posited that this particular smaller size may have been

[152] Frances A. Pritchard, 'Weaving Tablets from Roman London', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), pp. 157-161 (p. 160).

[153] Pritchard, 'Weaving Tablets', p. 157.

[154] Pritchard, 'Weaving Tablets', p. 157.

[155] Bender Jørgensen, *North European Textiles*, p. 129.

[156] Walton Rogers, 'Sword-Beater', p. 33.

used for silk work, though the size difference may be related to the available bone or the preference of the weaver.[157] It is the distance between the threads that determines the size of the shed, which is the most important aspect of weaving with tablets, not the thickness or fibre content of the thread.

Bone weaving cards were often created from the scapulae of cattle. Rubbish heaps in places like Angel Court, London, have provided scapulae with square and triangular sections removed.[158] These particular bones were used because only they were large and flat enough to make usable weaving cards.[159]

2.4. Butterflies and Shuttles

Some form of tool may have been used to carry a sizeable amount of weft yarn and allow the yarn to unroll from the tool to distribute the weft thread through the shed of the loom. Hand weavers using modern floor looms tend to use three types of shuttles. One type is a specially designed stick shuttle which is flat with tapering along the longer edges and notches cut out of the shorter edges to hold the weft yarns. Another type of shuttle is a boat shaped wooden shuttle with a bobbin nestled inside on a rod to hold the weft and unroll it as needed. The third type is a mechanised fly shuttle that throws the shuttle through the shed without being touched by the weaver. Other types of tools are used to carry and manipulate weft thread, but these are the primary variants currently in use.

Tapestry weavers often use butterflies which are technically not separate tools, but specially wrapped weft yarns using the yarn itself to perform the functions

[157] Penelope Walton Rogers, 'Textile Making Equipment', *Craft, Industry and Everyday Life: Bone, Antler, Ivory and Horn from Anglo-Scandinavian and Medieval York*, The Archaeology of York: The Small Finds 17.12, ed. by A. MacGregor, A. J. Mainman and N. S. H. Rogers (York: Council for British Archaeology, 1999), p. 1969.

[158] Pritchard, 'Weaving Tablets', pp. 158-159.

[159] Pritchard, 'Weaving Tablets', p. 160.

of shuttles. One way to create a butterfly, weft yarn is wrapped in a figure eight around the thumb and smallest finger many times. Then the bundle of yarn, reminiscent of a butterfly, is removed and weft yarn is wound around the centre of the bundle eventually creating a cigar shape until the wanted amount of yarn is achieved.[160] This then unrolls as the weaver works the butterfly through the shed.

Determining the type of shuttles used with the warp weighted loom, if any, is problematic to say the least. Archaeologically, no items definitely proven to be shuttles during the Anglo-Saxon and Viking eras exist in an English context.[161] Kristina Ambrosiani's work includes a report on seven bones found in the Birka and Ribe digs in Sweden with holes in one end could have been shuttles, although she does admit the items could have been sinkers for fishing nets also.[162]

Many modern shuttles usually require a horizontal surface to slide across as it passes through the shed, with the exception of variants like the stick shuttle. The surface is usually provided by either a shelf on the beater bar or the warp itself while under tension. The warp weighted loom does not have the necessary surface for a shuttle. The shed opens vertically in upright looms, instead of horizontally in the manner of modern floor looms. This makes warp thread unusable for the necessary surface in upright looms. Anytime the weaver releases the weft thread while the shed is open on a warp weighted loom, it can drop to the floor out of control. Because the beater used to tap weft into place in a warp weighted loom is an unattached tool, instead of a shelf on a beater bar with a reed as used by some floor looms, there is no secondary option for the surface to slide a shuttle along.

[160] Nancy Harvey, *Tapestry Weaving: A Comprehensive Study Guide* (Loveland, Colorado: Interweave Press, 1991), p. 41.

[161] Barber, *Prehistoric Textiles*, p. 107; Hyer and Owen-Crocker, 'Woven Works', p. 170.

[162] Kristina Ambrosiani, *Viking Age Combs, Comb Making and Comb Makers in the Light of the Finds from Birka and Ribe* (Stockholm: Stockholm Studies in Archaeology 2, 1981), p. 136.

Alfred Barlow, writing in 1878, was convinced that such a platform must have existed. As the inventor of the double action Jacquard loom, Barlow was very knowledgeable about loom construction, though seemingly unfamiliar with primitive loom technology.[163] In his book, *The Principles of Weaving by Hand and by Power*, he explains that the use of a comb or weaving sword to beat in the weft did not automatically preclude the use of a 'reed' to slide the shuttle across. Indeed, he writes 'the reed itself is but a species of comb' and would therefore be stiff and wide enough to be the necessary platform for the shuttle. In the accompanying illustration to the few pages focusing on the warp weighted loom he included a drawing of a modern boat shuttle, which he assumed was the preferred tool to carry weft yarn, though he never specified what he thought might be the reed for the shuttle to slide across (see figure 24). He does suggest it is some sort of hand held tool.[164] It would be difficult to manage a long, horizontal, flat surface with one hand, while attempting to move a shuttle along the length of the tool with the other. Such a tool would also have to be able to either slide between the warp threads or fit within a shed. Using a weft roll, oddly also included in the Barlow diagram, is a much more convenient process than the one he suggests.

[163] *Official Catalogue of the Great Exhibition of the Works of Industry of All Nations, 1851: Official Descriptive and Illustrated Catalogue, Part II, Classes V. to X., Machinery* (London: W. Clowes & Sons, 1851), Class VI, entry 82.

[164] Alfred Barlow, *The History and Principles of Weaving by Hand and by Power* (London: Low, Marston, Searle and Rivington, 1878), pp. 58-59.

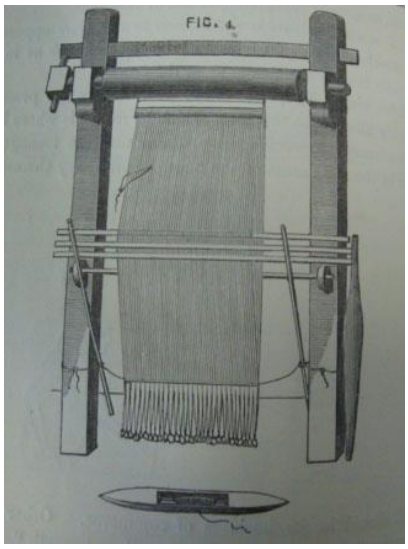

Figure 24. Drawing for Barlow's *Weaving by Hand and by Power*, p. 58 (fig. 4).

Medieval versions of a boat shuttle have been found in archaeological digs that date to thirteenth century Cork, Ireland, where two examples made of wood have been located. Since no definitive archaeological evidence for the warp weighted loom has been found in Ireland, and the loom type had been replaced as the primary weaving tool for some three hundred years in England by this time, these early boat shuttles were most likely associated with floor looms.[165]

There may have been some device that functioned like a shuttle that was known to Anglo-Saxon England, as linguistic evidence for the tool exists. The modern word for a weaver's shuttle derives from *scytel*, the Anglo-Saxon word for dart or arrow, which makes sense as the shuttle darts between the lines of warp, or can be seen to pierce the shed.[166] The Anglo-Saxon word is first documented in the Épinal manuscript, Bibliothèque Municipal MS 72, dating to the eighth century, using the variant spelling *scytil*.[167] This first example is from a tenth century copy of an Old English gloss of the Latin word *momentum*, which translates as 'movement',

[165] FitzGerald, 'Early Medieval Ireland', p. 156.

[166] Bosworth and Toller, *Anglo-Saxon Dictionary*, p. 848.

[167] Joseph Donovan Pheifer, ed., *Old English Glosses in the Épinal-Erfurt Glossary* (Oxford: Oxford University Press, 1974), pp. xxii, 34.

'motion', or 'a little space', also easily associated with weft moving through the shed of the loom.[168]

Old English also has the word *hrisil* or *hrisel* with the definition 'shuttle'. A secondary definition of 'radius' may indicate that thread or yarn was wrapped around a shuttle made from a stick in the same manner as a thread indicating the radius of a circle can be moved to create a circle.[169] *Hrisel* appears in Riddle 35 of the Exeter Book and fourteen other places in the Anglo-Saxon corpus, primarily in glossaries. The Exeter Book dates to the early tenth century, though some of the riddles may have been composed as early as the seventh century.[170]

Sceaðele, a *hapax legomenon*, or a word that only appears once, comes from the text *Gerefa*, a set of written rules intended to instruct reeves in their duties to those people under their care.[171] Because the word is in a list of related weaving tools, the exact translation can only be guessed at, but the similarity to *scytel* makes 'shuttle' a reasonable translation of the word.[172] The text dates to the eleventh or twelfth century, about a hundred years after the warp weighted loom started disappearing in urban centers, which makes the connection between the document and a shuttle designed for that particular loom type tenuous, though possible, as the loom was still in use in small towns.[173] However, if the shuttle used with a warp weighted loom was a simple stick with weft yarn wrapped around it, there would be no need for the tool to be provided by a person with wealth and authority (see figure

[168] Ethan Allen Andrews, Charlton Thomas Lewis, and Charles Short, *A Latin Dictionary Founded on Andrews' Edition of Freund's Latin Dictionary* (Oxford: Clarendon Press, 1951), p. 1160.

[169] Bosworth and Toller, *Anglo-Saxon Dictionary*, p. 562.

[170] John Porter, *Anglo-Saxon Riddles* (Norfolk: Anglo-Saxon Books, 1995), pp. 8, 58.

[171] Cambridge, Corpus Christi College Library, MS 383, folio 63v to 69r.

[172] Hyer and Owen-Crocker, 'Woven Works', p. 170.

[173] Walton Rogers, 'Old Roman Loom', p. 162.

25). The weaver could easily gather sticks from the local environment to adapt for the purpose.

Ambrosiani mentions the Icelandic word for shuttle, *þráðarleggir*, which is a compound word for 'thread' and 'lying next to', or 'thread-layer', according to the 1874 Icelandic/English dictionary by Cleasby and Vigfusson.[174] The definition seemingly comes from a rather poetic vision of the workings of a shuttle.

Figure 25. Weft wrapped sticks, or shuttles, on the grave marker from Nahilan, Turkey. See figure 9 for entire image.

Greek linguistic evidence for shuttles is often found in the literature on warp weighted looms, and is also somewhat problematic. According to a dictionary by Hesychius, *pēnion* translates as 'a spindle on which weft is wrapped', which fulfils the basic requirements for a shuttle.[175] Art work of the warp weighted loom on a fifth century BC *leykthos* shows such devices resting in either side in the corner between the uprights of the loom and the heddle bar. Another is being threaded through the warp by the weaver on the right, while the weaver on the left beat the warp with a long, slender stick (see figure 26). Elizabeth Wayland Barber suggests that removing a spindle whorl from the spindle, which was essentially a specifically crafted slender stick, may have been a way to create an instant shuttle, therefore saving time and a few steps in the process from spinning to weaving.[176] This would only function if the yarn was intended for use in weaving fairly soon after being spun. If a process called

[174] Ambrosiani, p. 136; Richard Cleasby and Gudbrand Vifgusson, *An Icelandic-English Dictionary* (Oxford: Clarendon Press, 1874), pp. 378, 744.

[175] Barber, *Prehistoric Textiles*, p. 107.

[176] Barber, *Prehistoric Textiles*, p. 107.

'setting the twist', which involves getting the yarn wet and putting it under some stress, does not occur, the yarn can lose cohesiveness, unravelling over time.

Figure 26. Image of a *leykthos* from the Metropolitan Museum of Art, New York City, New York.

Another possible Greek word for shuttle, *κερκίς*, is contentious: it has been translated to shuttle, rod, or comb.[177] Because of the multiple meanings and varying translations, it is discussed in the section on 'pin beaters' later in this thesis.

More recently, Icelandic speakers use the words *vinduteinn* and *skafthelder* in relation to shuttle type tools related to the warp weighted loom. Usage of these terms dates back to sometime around 1800, which would relate more to the vocabulary of more recent weavers than those in the Anglo-Saxon or Viking periods. Still, as the words are used specifically in relation with the warp weighted loom, they are worth consideration.

Vinduteinn is thought to mean a curved stick or rod used to make weft rolls. Documented in 1914 by Matthías Đórðarson, he uses the term to describe a loom reconstruction for his museum in Reykjavík using a combination of old and new loom parts.[178] Guðrún Bjarnadóttir, an Icelandic woman, also uses the term in an interview conducted in 1870, documenting her work as a weaver on the warp

[177] Grace M. Crowfoot, 'Of the Warp-Weighted Loom', *Annual of the British School at Athens*, 37 (1936-7), p. 44.

[178] Hoffmann, *Warp-Weighted Loom*, p. 119.

weighted loom. She was born in 1800, and was relying on the memory of working with her grandmother at the time of the interview.[179] There has been no discovery of artwork or archaeology confirming a tool with that particular name. The Bjarnadóttir interview has been combined with the curved tool caught in the weft of the original Hólm drawing, later labelled as *hrœll* in the Olafsson wood cut, to suggest an idea of what the *vinduteinn* may have looked like (see figure 27).[180] There has been no direct evidence for this tool.

Figure 27. Close up detail of the *hrœll* from the Hólm drawing, 1878.

Skafthelder also has been thought to refer to a tool to make weft rolls by Elsa Guðjónsson, though she admits the word has no agreed upon definition.[181] Hoffmann defines the term in the glossary of her work as a heddle rod support.[182]

The process for creating a weft roll was documented by Anna Grostøl, who filmed a Norwegian woman using a warp weighted loom in the towns of Olderdalen and Manndalen in 1947. This unidentified weaver does not use a tool to create the weft roll, but simply uses her hands. She starts with a butterfly, wrapping the figure eight around her thumb and smallest finger, continuing to wrap the yarn around the butterfly. Periodically she measures out the yarn to the length of her arm, returning it to the hand holding the butterfly. This creates a loop, which is left to hang out of the main body of the roll and is caught in the butterfly by wrapping more yarn around the butterfly and loop end. She repeats the process until she was satisfied with the

[179] Hoffmann, *Warp-Weighted Loom*, p. 348.

[180] Hoffmann, *Warp-Weighted Loom*, p. 119.

[181] Guðjónsson, 'Járnvarðr Yllir', p. 186.

[182] Hoffmann, *Warp-Weighted Loom*, p. 420.

size of the weft roll.[183] A weft roll holds more yarn than a butterfly, taking less time away from the weaving process, and leaving fewer ends in the finished piece, which is generally desirable.

Hoffmann also documents this process. The weft roll is called an *ud'do* in Lappish, the language of the weavers in her study. According to the Lappish weavers, one skein, an ambiguous measurement, is enough yarn to make two *ud'dos*.[184]

It should be noted that while butterflies, weft rolls, and *ud'dos* all perform the same function as a shuttle - delivering weft thread through the shed while weaving - none are separate tools, but created solely from the weft yarn.

Though linguistic evidence suggests the possibility, evidence for the use of shuttles with the warp weighted loom in England during the Anglo-Saxon and Viking eras is ambiguous at best. Likely, the choice lay in the hands of the individual weaver, dependent on her training, available materials, and personal preference. Given that such tools have been lost to time along with other wood evidence of looms, it never may be known what types of shuttles, if any, were used with the warp weighted loom.

2.5. 'Pin Beaters'

'Pin beaters' pose a particularly interesting academic problem. The bone objects are small, measuring roughly between five and sixteen centimetres in length, and round or ovoid in cross section. The tools are found in Roman sites in Britain and Germany, beyond the frontier borders of fourth and fifth century Europe, on either side of the North Sea, with a scant handful found in Anglo-Saxon women's graves

[183] Grostøl, < http://www.youtube.com/watch?v=qxA1bpj6lB0> [accessed 2 Feb 2013].

[184] Hoffmann, *Warp-Weighted Loom*, pp. 66-67.

from the seventh and eighth centuries.[185] Of those, only one find also had other definitive textile equipment found in relation to the 'pin beaters' in the form of an ivory weaving tablet.[186]

As with the other weaving tools of this era, no individual published work covers the known finds of an entire town or single county, let alone the entire holdings of Anglo-Saxon or Anglo-Viking settled lands. Several excellent works discuss some major archaeological sites, specifically those of Flixborough, West Stow, Mucking, and the Coppergate and Fishergate sites of York. For the most part, however, these bone tools have been the study of very few archaeologists beyond initial identification and cataloguing.[187]

Penelope Walton Rogers separates 'pin beaters' into three distinct types. The first is a cigar shaped, double-ended tool with two working ends. The second is single-ended and oval or rectangular in cross section, with wear along the tip and middle of the shaft, and a chisel shaped butt end (see figure 28). 'Pin beaters' falling under this category occasionally have holes drilled into the butt end through which a cord or string might be threaded. The third type of 'pin beater' tends to be roughly two centimetres longer than the second, with a rounder cross section and an unfinished butt end.[188] Personal examination of one hundred thirty eight bone tools

[185] One double ended pin beater was found in the cemetery at Castledyke South, Barton-on-Humber, another in Dover, with a single instance of two found together in Kent. Gail Drinkall and Martin Foreman, eds., *The Anglo-Saxon Cemetery at Castledyke South, Barton-on-Humber*, Sheffield Archaeological Reports 6 (Sheffield: Sheffield Academic Press, 1998), p. 292; Vera Evison, *Dover: The Buckland Anglo-Saxon Cemetery*, English Heritage Archaeological Reports 3 (London: Historic Buildings and Monuments Commission for England, 1987), p. 113; Bryan Faussett, *Inventorium Sepulchrale: an Account of Some Antiquities Dug Up at Gilton, Kingston, Sibertswold, Barfriston, Beakesbourne, Chartham, and Crundale, in the County of Kent from A.D. 1757 to A.D. 1773* (London: Printed for Subscribers Only, 1856), p. 93.

[186] Faussett, *Inventorium Sepulchrale*, p. 93.

[187] As an example, the archivists responsible for the large collection at the Museum of London were only able to locate ten items labelled pin beaters or thread pickers (four double-ended, six single ended) as of November 2011, though they were aware that a great many more were in the holdings of the museum. Only those ten had been catalogued in the present system. No record exists of the examination of this tool type in the previous ten years.

[188] Walton Rogers, *Craft, Industry and Everyday Life*, pp. 1967-68.

labelled ‘pin beaters’ or ‘thread pickers’ suggests that this typology is not entirely adequate as it considers only rough body shape and not the various tips and wear these tools demonstrate.

Figure 28. Examples of the current classification system: a double-ended ‘pin beater’ from the collections at the Museum of London; single-ended ‘pin beater’ with chisel end, and single-ended ‘pin beater’ with unfinished end from the collections of the York Archaeological Trust. Photographs by the author.

Current scholarship associates double-ended ‘pin beaters’ with the warp weighted loom and single-ended ‘pin beaters’ with the two beamed vertical loom.[189] The connection between ‘pin beaters’ and loom types has been made due to the increase of the single-ended forms of the tool around 900 AD, which corresponds to the decrease of loom weights and double-ended variants.[190] This certainly holds true for the excavation in Flixborough and several sites in York around this time frame.[191] However, a close examination of the evidence complicates an otherwise seemingly straightforward pronouncement.

Though tools now called ‘pin beaters’ date back to at least Classical Greece, the label ‘pin beater’ first comes into the literature concerning warp weighted looms with Grace M. Crowfoot’s twelve page publication ‘Of the Warp-Weighted Loom’ in 1936.[192] The term is first listed with diagrams of three types of primitive loom; the

[189] Coatsworth and Owen-Crocker, *Medieval Textiles*, p. 26.

[190] Walton Rogers, *Rural Settlement*, p. 110.

[191] Walton Rogers, ‘Old Roman Loom’, pp. 162-63.

[192] G. M. Crowfoot, ‘Warp-Weighted Loom’, pp. 37, 44.

Vertical Loom with Warp Weights (Northern Type), the Vertical Loom with Upper and Lower Beam (Modern Greek Type), and the Horizontal Ground Loom (Bedouin Type). The published drawing of the warp weighted loom is a reinterpretation of the woodcut created for Ólafsson's publication, which in turn is based on the Hólm drawing of an Icelandic loom.[193]

The tool from the Hólm illustration, labelled in the original drawing as a *hræll*, was altered from a gently curved tool taking up half of the width of the warp (see figure 14) to a more sharply curved tool about one quarter of the width of the warp for the Ólafsson woodcut (see figure 15). Crowfoot renames the tool and shrinks it even further for her diagram, adding more curve, and moves the tool out of the warp threads to the ground next to a greatly foreshortened and widened weaving sword (see figure 29).

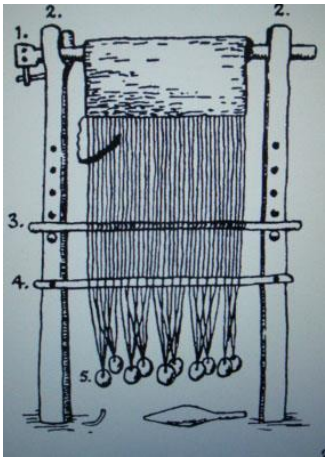

Figure 29. Grace M. Crowfoot drawing of a warp weighted loom. From 'Of the Warp-Weighted Loom', p. 38 (fig. 4). The tool labelled as a 'pin beater' is near the bottom of the left upright of the loom.

She continues to encourage the current concept of a 'pin beater' by stating the tool is well known among those using primitive looms.[194] Her supporting evidence comes from a 1918 textbook by Mary Lois Kissell, which includes a section on 'battening' or 'beating-in' using a tool to push weft into place (see figure

[193] G. M. Crowfoot, 'Warp-Weighted Loom', p. 40.

[194] G. M. Crowfoot, 'Warp-Weighted Loom', p. 40.

30). Kissell mentions that a short bodkin or slender pointed stick was used as an intermediary stage between fingers and weaving swords, but does not provide more than a rather generalised suggestion for usage of the tool. Nor is there any mention of cultural or artistic connections, tool size, or other sorts of detailed information to expound on her two sentence statement.[195]

The explanation of the bodkin type tool comes between a paragraph on a shed tool for Egyptian mat weavers and another on the weaving sword. This allows for the reading that the thin stick is inserted in the shed on the same plane as the weaving sword or shed sticks while being used to push the weft thread into place, and not turned to a ninety degree angle to slide between individual warp threads as Crowfoot suggests.

Figure 30. Use of slender stick to beat in weft, as suggested by Kissell. Greek *lekythos*, Metropolitan Museum of Art, New York.

Crowfoot understandably connects her concept of the newly coined 'pin beaters' to an item from her personal experience: a weaving tool made from of a gazelle horn used by Bedouin ground loom weavers (see figure 31).[196] The curve of her version of 'pin beater', especially as she draws it, does bring to mind the curve of a gazelle horn. This curving is not found in any of the Anglo-Saxon artefacts identified as 'pin beaters'.

[195] 'The short bodkin, or slender pointed stick, was an early tool for packing fine weft, especially in pattern making. It is thrust between the warp strands, which drives home in a better way than do the fingers.' Mary Lois Kissell, *Yarn and Cloth Making: An Economic Study* (New York: The MacMillan Company, 1918), pp. 104-5.

[196] G. M. Crowfoot, 'Warp-Weighted Loom', p. 44.

Figure 31. A modern gazelle horn weaving hook and demonstrated use by a Bedouin backstrap weaver. Photograph of weaver by Yosef Meyerowitz.

The Bedouin weavers used the tool to compact the weft further after using the weaving sword.[197] Gripping the 'pin beater' in the manner observed in the above image (see figure 31) is helpful for weaving movements that are downward or directed toward the body of the weaver. With the warp weighted loom the movement of the wrist is upward and away from the body of the weaver, making the observed use of the tool with a ground loom less effective for beating when transferred to the warp weighted loom. Crowfoot also observed an iron pin used in the same manner in Palestine, and reports she has seen a wooden 'pin beater' used on a two beamed vertical loom in Syria, stating that the weaver found the tool 'handy to deal with any thread that still proved refractory'.[198]

Crowfoot's wording suggests that the tool she is familiar with is used at a ninety degree angle from the weft threads, using the tip of the tool to manipulate a specific point in an individual thread, instead of using the length of the tool to push weft into place, which would create a curve along the line of weft thread, not place it neatly next to the last weft thread (see figure 32).

[197] G. M. Crowfoot, 'Warp-Weighted Loom', p. 37.

[198] G. M. Crowfoot, 'Warp-Weighted Loom', p. 45.

Figure 32. Use of ‘pin beater’ as understood through Crowfoot, using a grip observed by the author in archaeological artefacts. Photograph by author.

Hoffmann relates the stick in the *lekythos* (see figure 26) to the *hræll* (see figure 27), stating in passing that Crowfoot’s explanation of the tool is correct, without further explanation or exploration.[199]

Crowfoot’s understanding of the *hræll* was based on her observation of Bedouin rug weavers. The stick in the Greek image is used on the same plane as the weft thread, being inserted along the shed to push a line of the weft into place. Crowfoot has the weaver using the *hræll* by inserting it between warp threads at an angle from the plane of the cloth, pushing up a weft thread in a single spot to create arcs in the weft thread, or to separate threads that are tangled or stuck together.

It should also be noted that Crowfoot was watching rug weavers who create another type of tabby cloth where the weft was packed so tightly it completely covers the warp. Known Anglo-Saxon cloth does not generally fall into this category, and likely used different techniques to create.

The order of usage of these small bone tools and weaving swords shifts from the time before Crowfoot’s original identification of the ‘pin beater’ and her publication in 1936. Previous to Crowfoot, George Landt observed Faroe Islanders in the early 1800s, and noted they used a tool called a *reala-pind* which they used to

[199] Hoffmann, *Warp-Weighted Loom*, p. 319.

move the weft thread upward 'here and there' before and after changing a shed. This was then followed by the use of a whalebone weaving sword.[200]

Crowfoot observes ground loom weavers using the sword for the initial beating in of the weft, which reverses the order documented by Landt.[201] There is no evidence that Crowfoot was aware of Landt's work, however the Crowfoot explanation is repeated by the few authors writing on warp weighted looms, even though her evidence is based on a different form of loom requiring entirely different movements.

An experiment performed in 1952-53 from written sources without having seen anyone working on the warp weighted loom uses the 'pin beater' for a primary beating in of the weft before and after changing the shed, which is a return to Landt in the order of tool usage.[202] Walton Rogers agrees with this approach over the one suggested by Crowfoot.[203]

The concept of a 'pin beater' as an early medieval weaving tool is further reinforced by the 'very ancient' Faroese loom in Hoffmann's publication.[204] The loom, donated to the National Museum of Denmark in Copenhagen by Poul Jonsson in 1848, could only have been a few hundred years old at the time of donation, with some parts of more recent manufacture, making it a post-Renaissance example at best.[205] It is still on display at the museum with three items identified as 'pin beaters' by Hoffmann attached to the cloth beam of the loom (see figure 33). The bone objects came as part of the donation. Two are being used as temples, or devices to

[200] George (Jorgen) Landt, *A Description of the Feroe Islands, Containing an Account of Their Situation, Climate, and Productions; Together with the Manners, and Customs, of the Inhabitants, Their Trade, &c.* (London: Longman, Hurst, Rees, and Orme, 1810), p. 369.

[201] G. M. Crowfoot, 'Warp-Weighted Loom', p. 37.

[202] Hoffmann, *Warp-Weighted Loom*, p. 135.

[203] Walton Rogers, *Cloth and Clothing*, p. 29.

[204] Hoffman, *Warp-Weighted Loom*, p. 204.

[205] Hoffmann, *Warp-Weighted Loom*, p. 142.

keep the selvedge edges of the weaving even. The third is hung from a string from the middle of the loom.[206] All three are single-ended tools, which differs from Walton Rogers' assertion that double- ended 'pin beaters' belong with warp weighted looms. However, the loom comes from the Faroe Islands nearly a thousand years after Anglo-Saxons used warp weighted looms, so perhaps the associated tools changed over time. After close personal examination of these specific 'pin beaters', Hoffmann comes to the conclusion that the tools are not likely 'pin beaters', being too rough for textile production and likely to snag the threads while the weaver works and also would not lay conveniently in the hand of the weaver.[207]

Figure 33. Close up from figure 16 of supposed 'pin beaters' on loom at the National Museum of Denmark. Photograph provided by National Museum of Denmark.

Looking at the tools from a practical standpoint, the tool currently understood as a 'pin beater' presents some difficulties. When such a tool is not in use, it has to have a place to rest. When the weaver is sitting on the ground or on a bench as did those observed by Crowfoot, the tool can easily be placed next to the weaver when not needed, then picked up again as it will not likely have moved from where it has been placed due to it being on a hard, flat surface near at hand.

If the weaver is standing, as required while weaving on a warp weighted loom, there is no convenient surface within easy reach to place the small bone tool. The tool is too light and small to rest on the heddle loops without the risk of sliding

[206] Hoffmann, *Warp-Weighted Loom*, pp. 144-45.

[207] Hoffmann, *Warp-Weighted Loom*, p. 145.

through the strings and dropping to the ground, especially as the process of weaving moves the heddle bars. The weaver would frequently need to bend over to recover the tool before it could be used again.

Current understanding of Anglo-Saxon and Viking women's clothing suggests internal pockets did not yet exist.[208] Therefore, to have the tool at hand, the weaver would have to put the small tool on the floor or into some sort of pouch or basket after every use, which would add a great deal of tiring bending and stretching to the process of weaving. Bags that close with a pull string tend to close themselves with the movement of the wearer, so if a slender object was kept in such a bag, the weaver would have to pull it open to retrieve the tool, also causing a lot of extra movement and work. The movement of the weaver would also cause the supposed 'pin beater' to settle further down in the pouch, also making it more difficult to retrieve.

Threading a cord through a hole in the 'pin beater' to hang the tool around the weaver's neck or from her belt would solve the problem. However, so called double-ended 'pin beaters', which are theoretically associated with warp weighted looms, have no such holes nor are there likely places along the shaft to drill a hole. Tying a cord around the body of the 'pin beater' with which to hang the tool would create noticeable wear patterns, which have not been observed or recorded. Therefore, there is little archaeological evidence to support storing these tools on the body of the weaver. Wear patterns and other related archaeological evidence on so called single-ended 'pin beaters' suggest other possibilities, but as they are not thought to be related to warp weighted weaving in Anglo-Saxon England, they will not be discussed in detail in this thesis.

[208] The word 'pocket' first appears in the English Language in 1280, and is therefore unlikely to be an item of clothing for an Anglo-Saxon individual. 'Pocket', *Oxford English Dictionary* <www.oed.com>.

Tracing the 'pin beater' linguistically creates a different challenge. The only concrete linguistic tie between the art of the loom and the idea of the 'pin beater' comes from the book by Ólafsson. The word for the tool from the Hólm loom drawing in the book, *hrœll*, can also be found in the Icelandic saga *Njal's Saga*. The saga was originally composed around 1014 or 1015, was written down round 1280.[209] The poem *Darraðarljóð*, near the end of the tale, describes a group of mysterious women commonly identified as the Norns. The cloaked women enter a work hut and are observed mystically weaving the outcome of a battle on a warp weighted loom. The *hrœll* (also spelled *hrœl*, *rœl* or *rœll*) in this instance is made of an arrow, which continues along with the martial themes of the poem, which includes using a weapon, specifically a sword, as a beater. Exactly how the women use the tools is not explained.[210]

As an indicator of possible size for the Norns' *hrœll*, arrows found in the *Mary Rose*, a recently recovered ship from the fleet of Henry VIII, have arrows measuring nearly a metre long.[211] Today, arrows tend to be constructed based on the length of the archers' arms. As people have not varied widely in height from the time of the Viking invasions in England to the Britain of the sixteenth century, a metre is workable rough estimate for the length of Viking arrows.

Whether this should be taken as an indicator of the size of a *hrœll* is tenuous at best, as the poet has replaced warp weights with severed heads and the warp with intestines, which are both larger than the items they represent. On the other hand, the Norns use a weapon from the battle field, a sword, for the weaving sword. Adapting iron swords for weaving swords is known in the archaeology of Anglo-Saxon

[209] Guðjónsson, 'Járnvarðr Yllir', p. 185.

[210] *Njal's Saga*, in *Icelandic Saga Database* <http://sagadb.org/brennu-njals_saga> [accessed 9 March 2012], chapter 157; Robert Cook, trans., *Njal's Saga* (London: Penguin Books, Ltd., 2001), pp. 303-4.

[211] Matthew Strickland and Robert Hardy, *From Hastings to the Mary Rose: The Great Warbow* (Gloucester: Sutton Publishing Limited, 2005), p. 10.

England and Viking Norway.[212] It is possible that wooden *hræll*, if such an object existed, could have been made from, or look like, the shafts of arrows. If so, the most reasonable way to use such a tool would be in the manner of a sword beater, pushing lengths of weft thread into place in the shed of the weave.

According to the Cleasby and Vigfusson *An Icelandic-English Dictionary*, *hræll* translates to 'a weaver's rod or sley', with a sub heading explaining a *dún-hræll* is a rod for beating eider down. The related verb *hræla* translates as 'to beat a loom with a weaver's rod'.[213] These terms suggest something more related to the approach of weaving swords which are used to manipulate large sections of thread instead of small bone tools possibly used to adjust thread in one or two places.

Elsa Guðjónsson does not believe that the *hræll* was used for beating in the weft at all, as the task was performed with a weaving sword. She further argues that the tip of the tool was used instead of the length, albeit somewhat confusingly:

> '…the pin beater served several purposes. Firstly it was used to *gefa í*, i.e. to move the pick inserted in the shed downwards, forming a curve, then to *fæera upp að*, to move the pick upwards to the fell of the cloth here and there. Both operations were performed by thrusting the point of the *hræll* as required into the warp from the front of the loom.'

Lastly, she suggests, after changing the shed, first at one side, then at the other, the 'pin beater' was used to *hræla*, that is, to *jafna varpið*, to even out the warp. According to Guðrun Bjarnadóttir this was a task of importance for the production of a fabric of quality. The *hræling*, executed in two stages for each pick, was done by taking a firm hold of the selvage with one hand, at the side where the shed had just been changed. With the other hand the point of the 'pin beater' was drawn from there (in both the sources from 1881 the verb used for the action was

[212] Sue Harrington, *Aspects of Gender Identity and Craft Production in the European Migration Period: Iron Weaving Beaters and Associated Textile Making Tools from England, Norway and Alamannia*, British Archaeological Reports International Series 1797 (Oxford: John and Erica Hedges Limited, 2008), p. 52.

[213] Cleasby and Vifgusson, *Icelandic-English Dictionary*, p. 289.

rispa, literally *to scratch*) across the warp threads three or four times, close to the fell of the cloth. By this means the warp and the weft became evenly spaced. After changing the shed at the other side, the selvage there was gripped firmly and the point of the 'pin beater' drawn across the warp threads three or four times from that side.[214]

A description published in 1914 by Matthías Ðórðarson also reports that Icelandic weavers run the 'pin beater' across the warp, below the fell of the cloth, which is the point where the weft thread becomes part of the cloth.[215] Seemingly, they are suggesting that the 'pin beater', or *hrœll*, was used to assist in keeping the selvedges even and the warp and weft spaced evenly, though the process appears to be overly complicated for an experienced weaver who could control spacing by tensioning the weft thread appropriately during initial thread placement. Strumming a tool multiple times across the warp threads in an alternate direction from the way they lie in the loom also pulls out individual fibres from the thread, creating a segment more likely to snag, possibly weakening the structure of the thread itself.

The word *hrœll* is further associated in *An Icelandic-English Dictionary* with the Anglo-Saxon word *hreol*, meaning 'reel', a tool for winding yarn, which is also found in a twelfth century list of tools a good reeve should supply for his weavers.[216] This is the only known link between the Icelandic linguistic evidence and the Anglo-Saxon language. If the connection is more than just similar sounding words in completely different languages, it would suggest that our understanding of the use of

[214] Elsa E. Guðjónsson, 'Some Aspects of the Icelandic Warp-Weighted Loom, Vefstadur', *Textile History*, 21.2 (1990), pp. 165-79 (p. 174).

[215] Hoffmann, *Warp-Weighted Loom*, p. 127.

[216] Cleasby and Vifgusson, *Icelandic-English* Dictionary, p. 289; a transcription of the original Old English text can be found at 'Gerefa', *Early English Laws* <http://www.earlyenglishlaws.ac.uk/laws/texts> [accessed 30 Apr 2013].

a *hrœll* is misguided, or that Anglo-Saxon women used the same tool for a completely different purpose.

Early twentieth century scholars of warp weighted looms often look back to Classical Greece for information, referring to a Greek word, *κερκίς*, mentioned in the works of Homer, which translates as 'pin beater'.[217] This term has a broad range of meanings. The Liddell and Scott Greek-English dictionary translates it as 'a weaver's shuttle', with secondary meanings of 'any tapering rod, wood, ivory, etc.' and 'pin or comb'. Other possible translations include bones, specifically arm and leg bones. Another seemingly unrelated meaning is 'a wedge shaped section of theatre seats'.[218] Marta Hoffmann translates *κερκίς* as 'sword beater' based on the image of the weavers from the *lekythos* held by the Metropolitan Museum of Art (see figure 26).[219]

Barber points out that further examination of related Greek words brings to light interesting connections between the probable root word, *κρεκ*, with meanings related to hitting strings noisily with sharp instruments.[220] Perhaps the interpretation of striking of strings contributed to the idea that one of the uses of the supposed pin beater' is to strum across the strings of the weft to dislodge stuck threads.[221] The same procedure, which in practice is extremely quiet, can be accomplished with fingers, making the time and materials necessary to create a tool for that purpose unnecessary. Weavers often run their fingers across the warp as a quick way to judge the tension of the individual threads in relation to the rest of the warp, or simply for the enjoyment of the sensation. Another way to unstick warp threads from each other

[217] Henry George Liddell and Robert Scott, 'κερκίς**',** *A Greek-English Lexicon*, revised by Henry Stuart Jones (Oxford: Clarendon Press, 1940), p. 943.

[218] Liddell and Scott, 'κερκίς**',** *A Greek-English Lexicon,* p. 943.

[219] Hoffmann, *Warp-Weighted Loom*, p. 298.

[220] Barber, *Prehistoric Textiles*, p. 273.

[221] Walton Rogers, *Cloth and Clothing*, p. 29.

is to change the shed, which is required after the placement of every weft, once again belying the need for a specialized tool.

Barber also notes the pairing of two similar sets of words. Along with the pair *κερκίς* (*kerkis*) 'pin-beater' and *κρέκειν* (*krekein*) 'hit weft home, weave' the Classical Greek language has another pair: *σπάθη* (*spathē*) 'sword beater' and *σπάθαν* (*spathan*) 'hit weft home, weave'.[222] The verb variant of both *κερκίς* and *σπάθη* having the same meaning suggests the tools were used in the same manner when weaving.

Crowfoot estimates the specific beater in the *lekythos* to be around two feet or sixty one centimetres in length, though she also states that her understanding of the tool she calls a 'pin beater' is much shorter and curved.[223] The other possible tool that might translate as a 'pin beater' in the art record with a size can be determined is the Icelandic loom from the Ólafsson text. Calculating the size from the original Hólm drawing, assuming a measurement of 182 centimetres from the cloth beam to the ground, the *hræll* measures around 36.5 centimetres. However, the Anglo-Saxon era bone tools labeled 'pin beaters' measure less than half of that, generally falling between eight and ten centimetres in length, on average.[224]

Examples of known 'pin beaters' from other parts of northern Europe also call into question the tool identified in English archaeology as a 'pin beater' based on size differences. The museum in Thorshavn, Faroe Islands, has in its collection a *ræl*, the Faroese version of *hræll*, which Crowfoot translates as 'pin beater'. The Thorshavn *ræl* was created with the instructions of Anna dú Depli, a Faroese weaver

[222] Barber, *Prehistoric Textiles*, pp. 274.

[223] G. M. Crowfoot, 'Warp-Weighted Loom', p. 46.

[224] Ian Riddler and Nicola Trzaska-Nartowski, 'Chanting upon a Dunghill: Working Skeletal Materials', in *The Material Culture of Daily Living in the Anglo-Saxon World*, ed. by Maren Clegg Hyer and Gale R. Owen-Crocker (Exeter: University of Exeter Press, 2011), pp. 116-141 (p. 129). This measurement is supported with personal study of one hundred thirty seven single- and double-ended pin beaters from London, York, and Ipswich.

who lived in the late 1800s, who also had childhood experience weaving on the warp weighted loom. Her description of a *ræl* is a smooth, straight, flat stick twenty two centimeters long.[225] Wood examples from Greenland are also twenty two centimetres in length.[226] Hoffmann's Icelandic example is twenty one a half centimetres long.[227] She also mentions a bone needle from the same area with a length of sixteen and a half centimetres, for comparison.[228] These tools are roughly twice the length of the Anglo-Saxon era artefacts.

With Anglo-Saxon weaving swords having reported lengths starting at twenty four centimetres, it is possible the difference between the long, slender beaters known from art and linguistics, and weaving swords may be one of degree of size rather than entirely different types, sizes, and uses of tools.[229] FitzGerald writes of a small tool that might be a cross between a 'pin beater' and a sword beater because it has more wear on one end, suggesting the other end was habitually grasped by the weaver.[230] A weaving sword may be the larger and flatter of the tools, while the tool originally labelled a *κερκίς* or a *hrœll* is a slightly smaller, possibly rounder variant, with a grey area in between where the tools can be labelled as either in much the same way as there is a difference between thick yarns and thin threads with some gradients between called either term.

Three Roman era images of slender beater type tools have been published, all of which are from women's grave markers: one from Lara de los Infantes, Burgos,

[225] Hoffmann, *Warp-Weighted Loom*, p. 351.

[226] Arneborg and Østergärd, 'Notes', p. 170.

[227] Hoffmann, *Warp-Weighted Loom*, p. 126.

[228] Hoffmann, *Warp-Weighted Loom*, p. 351 (footnote 6).

[229] Leahy, *Anglo-Saxon Crafts*, p. 69.

[230] FitzGerald, 'Early Medieval Ireland', p. 145.

Spain, one from Nahilan, Turkey, and another from Baugy, France (see figure 34).[231] None of these bas relief depicts double-ended tools, though both the Spanish and Turkish grave markers have warp weighted looms. The grave marker from France depicts an upright loom of indeterminate type. These images also bring into question the relationship between double-ended 'pin beaters' and warp weighted looms, as the artwork all depicts a single-ended version of the tool.

Figure 34. Close up of possible pin beaters from Spain, Turkey, and France, from left to right. To see the entire image relating to these tools, see figures 10, 9, and 11 for entire images.

The image on the Spanish stone shows a weaver wielding both a single-ended beater and a weaving comb. The two tools on the Turkish grave marker are also single-ended, and the same size as the weaving comb on a cord and two sticks with balls of weft thread wrapped around them, which are also depicted. Whether that indicates the size of the beaters is debatable, as the other tools are not of proportionate size to the warp weighted loom on the stele.

The grave marker in Baugy, France, shows the woman holding a single-ended tool often labelled a 'pin beater' with the tip pointed downward at an upright loom that may be either a two beamed or warp weighted loom; the indicative bottom portion of the loom is not visible.[232] The grip the woman uses to hold the tool would be difficult to use for weaving as it does not give very accurate control of the tip of the tool.

If the tools on the grave markers are 'pin beaters', and not cloth beam spokes or shuttles as discussed in other sections of the thesis, then this suggests that the

[231] Wild, 'Romans in the West', pp. 84-85; Feugere, 'Métiers à Tisser Antiques d'Asie Mineure', p. 23; Walton Rogers, *Cloth and Clothing*, p. 35.

[232] FitzGerald, 'Early Medieval Ireland', p. 126; Walton Rogers, 'Old Roman Loom', p. 160.

tenuous connection between the warp weighted loom and double-ended 'pin beaters', if it were correct, could be argued as a particularly Anglo-Saxon preference.

However, the archaeological evidence for the connection between the tools currently known as 'pin beaters' and the warp weighted loom is not definitive. While archaeology can hardly be expected to have firm answers where comparatively little evidence has been studied, there are enough carefully recorded and published Anglo-Saxon and Viking sites in England to allow for some tentative conclusions to be drawn.

Items called 'pin beaters', also identified as 'thread pickers' in some archaeological reports and archives, have been found in both burial and settlement contexts in Sutton Courtenay, West Stow, Flixborough, Berinsfield, Didcot and York.[233] No similar tools have been found in Norway, where the tradition of weaving with a warp weighted loom continued in the longest unbroken tradition.[234] Interestingly, both double- and single-ended 'pin beaters' have been found in Ireland, a country where no warp weights have been found, sometimes with both types in the same archaeological context.[235]

Examination of a published diagram of textile tools discovered at West Stow demonstrating the movement of major halls over time shows icons of ten complete 'pin beaters' amongst the textile tools. Only once, in building 170, is a so-called 'pin beater' found with groupings of more than five warp weights: all ten occurrences, however, are associated with spindle whorl finds.[236] This might be indicative of

[233] Angela Boyle, 'Weaving Equipment' in *Two Oxfordshire Anglo-Saxon Cemeteries: Berinsfield and Didcot*, eds., Angela Boyle, Anne Dodd, David Miles and Andrew Mudd (Oxford, Oxford Committee for Archaeology for the Oxford Archaeological Unit, 1995) pp.228-9 (p. 228); West, 'West Stow', multiple pages; Walton Rogers, 'Textile Production', p. 282; Walton Rogers, T*extile Production at 16-22 Coppergate*, p. 1755.

[234] Hoffmann, *Warp-Weighted Loom*, p. 127.

[235] FitzGerald, 'Early Medieval Ireland', p. 153.

[236] West, 'West Stow', pp. 6-51, 125.

small tools being kept in work baskets. However, a diagram of the weaving hut Sunken Featured Building (SFB) 15, which burned down in the late sixth or early seventh century, does not appear to have any of these bone tools, even though the other textile equipment was found where it fell, which is not surprising considering how few were scattered around the site.[237]

A total of ten complete and ten fragments of the bone tools were found in the West Stow site. Only one hut, SFB 36, had more than a single 'pin beater': two were found there. The tools were found with a variety of other textile related equipment including spindle whorls, bronze and bone pins, and bronze and bone needles. Bone combs, which may or may not have been textile related items, were also found among the other tools. No other 'pin beaters' were located near or with warp weights in West Stow aside from the one from building 170.[238] If the tool were actually a weaving tool, more examples of the object should have been found.

The Flixborough site produced twelve of the bone tools. Five were located in rubbish piles, with the other seven being located at all levels of the excavation. Only in the layer dating to the tenth or eleventh century were two found in the same time frame.[239] Each strata layer produced a single one of these bone tools, though usually many warp weights. A single, thicker 'pin beater' was found in a rubbish heap context with unbaked and uncompleted warp weights as well as a block of clay.[240] It is possible that this tool, in this context at least, should be more closely associated with warp weight creation. Perhaps in this instance, the thicker than typical tool was used to work the centre hole into the annular clay weights preferred at the time.

[237] The diagram for that building can be found in Walton Rogers, *Cloth and Clothing,* p. 31.

[238] West, 'West Stow', pp. 6-51, 125.

[239] Walton Rogers, *Life and Economy*, p. 282.

[240] Walton Rogers, *Life and Economy*, p. 288.

One hundred and thirty seven tools identified as ‘pin beaters’ have been examined by the author: ten from the collection of the Museum of London, four double-ended, and six single-ended; thirty four from the collections of the York Archaeological Trust, two incomplete, and thirty two single-ended; and ninety three from the Ipswich area (courtesy of Ian Riddler), fourteen double-ended, and seventy three single-ended. While this is a small sampling from three areas with different textile histories, a few things can be extrapolated.

Though there is the possibility of wooden copies of the tool in early medieval England, for the most part wood does not survive in British contexts. Therefore, the bone examples present the best information currently available. Out of one hundred and thirty seven examined tools, only twenty three were double-ended, or between sixteen and seventeen per cent of the total. If all of the examined tools are indeed weaving tools, and double-ended examples are associated with warp weighted looms and the single-ended associated with the two beamed loom, it might indicate that the use of this tool increased greatly with the advent of the two beamed loom, or that textile activity increased because of the change in technology. Perhaps more wooden versions of double-ended tools were made.

Without a way to judge the number of wooden ‘pin beaters’, no definite conclusions about them can be drawn. However, to cope with the stresses that weaving would place on the tool, a fine grained hardwood would be required. Otherwise, the wood would splinter and snap, especially along the grain. Great care would also have to be taken to smooth the wood so that it would not snag on the threads while weaving. Creating wooden versions of the tool, if they existed, would take skill and carefully chosen woods.

Whole examples of both double-ended and single-ended bone tools in the sample measured between eight and eleven centimetres; about half the length of

known Icelandic and Faroese tools. This makes the English tools too small to be useful as weft beaters in the manner depicted in the art, because once the tool is gripped, there is not enough length left to beat in the weft effectively (see figure 35). When grip marks were found, the grip of the tool more closely resembled that of a modern day pen, intended for fine manipulation, and within a centimetre of the tip on one end.

Tips of the four double-ended tools from the Museum of London were examined under a microscope, showing signs of having been sharpened to a razor-like point. If the sharpening is an intentional part of the original tool and not part of the cleaning process after excavation, using the tip would damage the yarns while not cutting completely through them due to a lack of a secondary surface to press against or slide next to, like a pair of scissors or chopping board.

Figure 35. Two double-ended bone tools from the Ipswitch collection. Note the lack of expected wear marks (compare with figure 36), and the grip near the tip on the left. Photographs by author.

Other expected wear patterns did not appear to exist on the tools. Because weaving at the most basic level is the interlacing of thread at ninety degree angles, any wear on the beaters should be consistent around at least half the circumference of the tool. Also, the yarn should wear a down a section of the tool as the weaver would find a comfortable grip and movement of the tool during the weaving that would become habit (see figure 36 for expected wear patterns). No such wear was observed. Admittedly, these observations are based on an extremely limited sample.

Figure 36. Wear pattern developed on a bone weaving comb while weaving a sail on a warp weighted loom. From *Et uldsejl til Oselven*, p. 27 (fig. 15). Image and experiment by Anna Nørgaard.

Hoffmann believes weavers discontinued the use of 'pin beaters' around the time the warp weighted loom lost all usage, apart from the weaving of heavy blankets and coverlets. The weavers she observed did not use any sort of small tool as a beater, preferring to use their fingers.[241] The tool makes little sense for use creating lighter fabrics found in early medieval archaeology, as suggested by Walton Rogers, who considers the shape and weight of a 'pin beater' relevant to the types of textile created.[242]

Others have also questioned the viability of the so-called 'pin beater' as a weaving tool. A study conducted by Dorothée Chaoui-Derieux and Jean-François Goret in 2009 of both double- and single-ended pin beaters found that the ends of these bone tools could be either blunt or sharp, or occasionally with spatulate ends.[243] The wear patterns were distinct and different enough that an experiment was devised using a specific example of the tool as a pattern, which was then replicated twenty times by an expert bone carver. The copies were then distributed to twenty

[241] Hoffmann, *Warp-Weighted Loom*, p. 279.

[242] Walton Rogers, 'The Importance and Organization of Textile Production', p. 106; Walton Rogers, *Life and Economy*, p. 294.

[243] Dorothèe Chaoui-Derieux and Jean-François Goret, 'Les Outils en Os du Haut Moyen Âge: État de la Question et Presentation d'une Experience en Cours', *L'habitat Rural du haut Moyen Âge en Île-de-France*, ed. by François Gentili and Annie Lefèvre (Guiry-en-Vexin: Centre de Recherches Archéologiques du Vexin Français, 2009), pp. 79-92.

different craftsmen, including weavers, potters, basket makers and scribes to learn how the wear patterns created by these crafts match or differ from the archaeological evidence. The follow up report has yet to be published.[244]

The final area of consideration for the use of these bone tools with the warp weighted loom is the living tradition, documented by Marta Hoffmann and Anna Grostøl in the 1940s and 1950s. Both women were working to record the dying weaving traditions of Norway and Lappland, and used film to augment their work. The resulting silent movies have been posted on the internet in November 2012 by the Norwegian Folk Museum, allowing for in depth study not previously possible.[245] Hoffmann notes that none of her sets of weavers use tools, only their fingers, to accomplish the tasks of initial beating in, weft tension, and manipulation of individual threads.[246] The weaver documented by Grostøl also uses her fingers instead of a tool, preferring to pull the shed farther apart to move the weft threads closer together, thus using the warp itself to adjust the weft.[247] However, it should be noted that the weavers in question were all Norwegian, a part of Europe with no archaeological evidence of the bone tools currently called 'pin beaters'.

With so much of the evidence of the tools labeled 'pin beater' either coming up as inconclusive, or in some cases, negating current understanding of the uses, size, and historiography of the archaeological finds, a more in depth study examining wear patterns, location within a community, and relationships between the bone tools and known weaving tools seems in order. While it is possible some of the currently

[244] Chaoui-Derieux and Goret, 'Les Outils en Os du Haut Moyen Âge', pp. 79, 80, 87.

[245] *Norwegian Folk Museum* <http://www.digitaltmuseum.no/things/vevstol-med-renning-og-kljstein-tegnet-av/NF/NF.06849-001> [accessed 8 Mar 2013].

[246] Hoffmann, *Warp-Weighted Loom*, p. 44.

[247] *Norwegian Folk Museum*, 'Grenevev del 3 av 3.

known ‘pin beaters’ may have been used for weaving, without better evidence it may be prudent to remove the tool from the list of known weaving implements.

2.6. Combs

Combs are another possible tool for beating the weft into place. There is linguistic evidence that weaving combs of some form were in use in Anglo-Saxon England. The *Gerefa* mentions two terms, *pihten* and *wulcamb*, both found in the list of textile tools.[248] A *wulcamb*, or wool comb, is most likely the word for the type of comb used for cleaning and straightening the fibres of wool before spinning. The meaning of *pihten* is more obscure. *An Anglo-Saxon Dictionary* gives the definition ‘part of a loom’.[249] More recent scholars believe the word more correctly translates to ‘weaving comb’, though the shape of this type of comb is uncertain.[250]

Figure 37. Curved back comb from Jorvik Viking Centre, triangular backed comb from West Stow, and double sided comb from Sutton Courtenay. Jorvik comb photo by author. Photographer of West Stow comb unknown. Sutton Courtenay comb image from the Ashmolean Museum website.

[248] Cambridge, Corpus Christi College Library, MS 383, folio 68v, transcription available through ‘Gerefa’, *Early English Laws* <http://www.earlyenglishlaws.ac.uk/laws/texts> [accessed 30 Apr 2013].

[249] Bosworth and Toller, *Anglo-Saxon Dictionary*, p. 773.

[250] Hyer and Owen-Crocker, ‘Woven Works’, p. 171; Christine Fell, Cecily Clark and Elizabeth Williams, *Women in Anglo-Saxon England and the Impact of 1066* (London: British Museum Publications Ltd., 1984), p. 43, 171.

Artefacts that may be these weaving combs are the curved back, triangular-backed, and double-sided combs which closely resemble modern combs for hair, commonly found in Anglo-Saxon era archaeological excavations (see figure 37).[251] Combs such as these are often found in contexts with other textile tools, such as spindle whorls, bone pins and needles, and the occasional 'pin beater'.[252] Because combs can serve other purposes aside from tidying hair, it is possible that these types of combs served multiple purposes and were also used for beating weft into place.[253]

Experiments involving reconstructions of bone combs from known artefacts to produce wear patterns have been undertaken.[254] Early findings suggest use in hair creates highly polished, rounded ends with marks parallel to the length of the tooth.[255] Use as a weaving tool creates more pointed ends and wear marks horizontal to the length of the tooth in multiple lines along the row of teeth.[256] Further experimentation is needed before the findings can be considered definitive.

[251] Walton Rogers, *Rural Settlement*, p. 107; West, 'West Stow', multiple references.

[252] West, 'West Stow', pp. 18-52.

[253] Ambrosiani, *Viking Age Combs*, p. 13.

[254] Erik Andersen and Anna Nørgaard, *Et uldsejl til Oselven: Arbejdsrapport om fremstillingen af et uldsejl til en traditionel vestnorsk båd* (Roskild: Vikingeskimuseet, 2009).

[255] Person experiment, results as of 17 March 2014.

[256] Andersen and Nørgaard, *Et uldsejl til Oselven*, p. 27 (fig. 15).

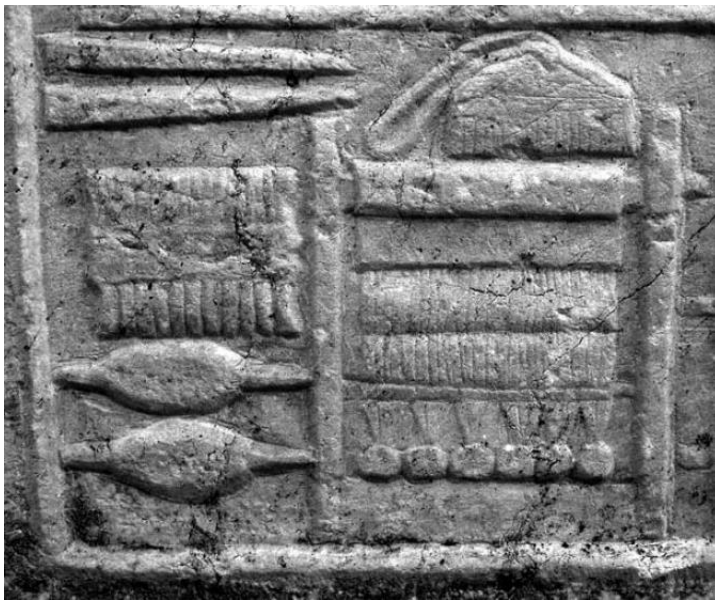

Figure 38. Close up of section of grave marker, Nahilan, Turkey showing two types of combs: a trianglar-backed comb on a string over the loom and a double-sided comb on the left side.

Evidence from artwork exists demonstrating an association between warp weighted looms and weaving combs. The Roman era grave marker from Nahilan, Turkey, shows both a double-sided comb and a triangular-backed comb on a string among the other textile tools next to a warp weighted loom (see figure 38).[257] The triangular-backed comb seems to be the most likely to be a weaving tool. Attaching a comb to a string seems to be a useful way to store the comb while not actively in use - around the neck of the weaver - while her hands are busy with other parts of the weaving process. This does not preclude using the double-sided comb as a weaving tool, however, as the comb can be rested with the teeth caught in the heddles when not actively in use.[258]

[257] Wild, 'Romans in the West', pp. 84-85.

[258] I am currently involved in an experiment where two red deer antler combs have been commissioned, one for use in hair, and one for weaving, to compare wear patterns. I keep the weaving comb in my heddles. I find it easier to use than my sword beater, as I can control weft placement slightly better, and the antler slides more easily through the warp than the wood. The comb also catches the weft to move it upward while the sword uses the crossed threads of the changed shed of the warp threads, which creates some resistance.

2.7. Sword beaters

This type of weft beater is the most closely associated with warp weighted weaving of all the beating tools, likely because of the research of Marta Hoffmann. The weavers she studied used sword beaters exclusively, if any beating tool was used.[259] Some of the weavers preferred to beat the weft into place using only their fingers.[260] The weaver filmed by Grostøl in 1955 also chose not to use a weft beater. She moved the weft into place by first using her fingers for the initial beating in, then followed up by changing the shed, which allowed the warp threads to trap the weft thread. She then pulled the warp threads further apart, which pushed the weft tightly upward.[261]

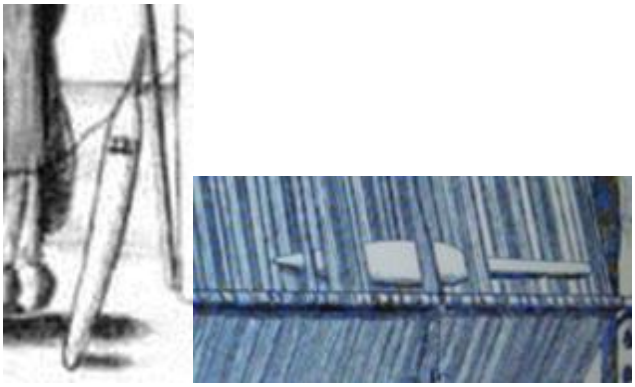

Figure 39. Close ups of the weaving swords for the Hólm loom (left) and Worsaae loom (right). See figures 14 and 16 for complete images.

Weaving swords could be made of bone, ivory, metal, and of course, wood. The relative scarcity of surviving tools suggests that the majority of sword beaters

[259] Hoffmann, *Warp-Weighted Loom*, pp. 40, 44, 47.

[260] Hoffmann, *Warp-Weighted Loom*, p. 71.

[261] *Norwegian Folk Museum*, 'Grenevev del 3 av 3'.

were likely made of wood.[262] Those constructed out of iron have the largest survival rate in the archaeology.[263]

The earliest known sword beaters in the British Isles appear at the beginning of the Anglo-Saxon era.[264] The concept migrated into England through Kent and Essex, as all finds dating before the eighth century are from these and the surrounding counties.[265] Weaving swords appear to reach Lincolnshire and York in the ninth century.[266] The tool was still in use after the Norman Conquest. One bone example from Wallingford dates to about 1150 AD.[267]

Unusually for textile tools, there is a single study cataloguing and discussing fourteen apparent iron weaving swords that date to England between 450-1100 AD.[268] It does not discuss all known artefacts and limits the composition and shape of the tool described to sword-shaped iron beaters with possible double tangs. All of the finds in this study come from the south east part of the island, with more than half of the artefacts coming from Kent.[269]

Two general shapes are prominent among long weft beaters but tend to get discussed together as sword beaters; the traditional sword shape mentioned above and the leaf shaped spear blade (see figure 39).[270] Artefacts believed to be sword beaters from Anglo-Saxon cemeteries that have undergone study tend to be between

[262] Harrington, *Aspects of Gender Identity*, p. 32.

[263] Harrington, *Aspects of Gender Identity*, p. 29.

[264] Walton Rogers, 'Sword-Beater', p. 887.

[265] Harrington, *Aspects of Gender Identity*, p. 99.

[266] Walton Rogers, 'Sword-Beater', p. 887.

[267] Elisabeth Okasha, *Hand-list of Anglo-Saxon Non-runic Inscriptions* (Cambridge: University Press, 1971), p. 119.

[268] Harrington, *Aspects of Gender Identity*, p. 29-34, fig. 7, and appendix 3.

[269] Harrington, *Aspects of Gender Identity*, p. 99, fig. 8.

[270] Walton Rogers, *Cloth and Clothing*, p. 33.

240 millimetres to 590 millimetres in length.[271] However, the length changes over time, from 376 millimetre long beater found in a an early sixth century gave at Buckland, Kent, to a 765 millimetre example found in a seventh century burial at Edix Hill in Cambridgeshire.[272] English sword beaters tend to be shorter than their Nordic counterparts, which are usually between 600 millimetres and 800 millimetres, with a few examples about a metre long.[273]

Spear shaped beaters appear later in the archaeological record, and seem to reflect the ability of local weapon smiths, though this difference might also be influenced by the preference of the weavers or the availability of materials.[274] The size of these beaters ranged from one 262 millimetres in length from mid sixth century Searby, Lincolnshire, to a 535 millimetre example from ninth century York.[275] Some leaf shaped blades found in women's graves in Gloucestershire and Cambridgeshire have been reassessed, and are now believed to be weaving tools instead of actual weapons, as was previously thought.[276]

It has been suggested that this particular choice of shape may indicate this type of beater fulfilled a slightly different function, which makes no logical sense.[277] At the most basic level, all weaving is an interlacing of thread at ninety degree angles. The shape and size of the beater does not change the angle of the threads in relationship to each other, only indicates the preference of the weaver and the amount of energy required to beat in the weft thread to the desired density. Another

[271] Walton Rogers, 'Sword-Beater', p. 887.

[272] Helen Geake, *The Use of Grave-Goods in Conversion-Period England, c. 600-850* (Oxford: John & Erica Hedges, 1997), p. 147.

[273] Østergård, *Woven into the Earth*, p. 57.

[274] Harrington, *Aspects of Gender Identity*, p. 29; Walton Rogers, *Cloth and Clothing*, p. 34.

[275] Walton Rogers, *Cloth and Clothing*, p. 34.

[276] Walton Rogers, *Cloth and Clothing*, p. 34.

[277] Harrington, *Aspects of Gender Identity*, p. 29.

possibility the spear shaped beater represents is availability of materials. Perhaps more spear heads were obtainable to convert into weaving tools.

Most of the iron examples of weaving swords were originally created as weapons, but were repurposed as weaving tools.[278] An indicator that a weapon of war had been altered to a tool for weaving was first discovered in Britain in the Isle of Thanet in 1845. A sword was excavated that had a second tang, or grip, attached to the tip of the blade. More than twenty examples have been found in England since then.[279]

Bone examples of weaving swords have the same shapes as iron examples, but tend to be longer and lighter.[280] Bone beaters can be more interesting in some aspects, as a few have been personalized.[281] One extant weaving sword fragment has an Anglo-Saxon woman's name, Eadburg, carved into it (see figure 40).[282] Another bone weaving sword has a battle scene etched into the blade.[283]

Figure 40. Engraved bone weaving sword fragment, now in Reading Museum. Photo by Elisabeth Okasha.

[278] Walton Rogers, *Cloth and Clothing*, p. 33.

[279] Harrington, *Aspects of Gender Identity*, p. 29.

[280] Lilli Fransen, Anna Nørgaard and Else Østergård, *Medieval Garments Reconstructed: Norse Clothing Patterns* (Aarhus: Narayana Press, 2011), p. 27.

[281] Okasha, *Anglo-Saxon Non-runic Inscriptions*, p. 119.

[282] Coatsworth and Owen-Crocker, *Medieval Textiles*, p. 26.

[283] Østergård, *Woven into the Earth*, p. 57.

Bone or ivory weaving swords also have an interesting a natural curve to them, because they are made from ribs or tusks.[284] The same curve can be found in the 1878 Hólm drawing of an Icelandic loom with the problematic *hræll* from the section on pin beaters (see figure 41).

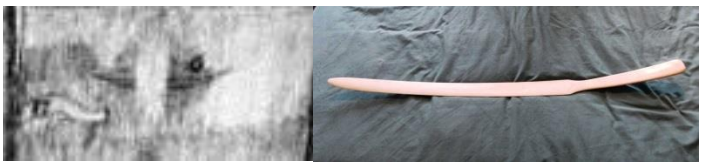

Figure 41. On the left is a close up of the *hræll* from the Hólm drawing (see fig. 14). On the right is a modern whalebone weaving sword made from a rib bone from the personal collection of Ian Uzzell. Photograph by Ian Uzzel.

Egon Hansen, in his treatise on the warp weighted loom, also interprets the *hræll* as a tool more like a sword beater. He created a wood version based on his understanding of the woodcut version of the loom (see figure 42).[285] Calculating the size of the tool based on the original drawing, with a measurement of 182 centimetres from the cloth beam to the ground, the *hræll* measures around 365 millimetres, well within the size range of Anglo-Saxon weaving swords.

Figure 42. Weft beater from Egon H. Hansen, *Opstadvæv før og nu*, p. 38 (fig. 41).

The Hansen weft beater makes little sense as a weaving tool. Because of the curve along the edge of the tool, only a small section effectively presses a weft thread into place, instead of the entire length of the tool, as can be found in weaving swords. The curve found in the whale rib bone beater (see figure 39) is along the

[284] Hoffmann, *Warp-Weighted Loom*, p. 282.

[285] Egon H. Hansen, *Opstadvæv før og nu*, Før og nu-serien, 1 (Copenhagen: Teamco, 1978), p. 38.

length of the tool but not the edge, which still leaves the edge parallel to the weft, allowing for more efficient placement of threads in the weaving process.

Most sword beaters come from women's burials, though some male burials in Norway also have produced weaving swords as well.[286] Wealth is associated with metal versions of the tool, as English burials with the beaters have rich grave furnishings.[287] Though these women were wealthy, they are not among the wealthiest when compared with the other occupants of the graveyard.[288] Whether such details suggest that these women were wealthy enough to have slaves weave for their households, or whether a sword beater in the grave meant they were accomplished weavers is undetermined.[289] Not being among the richest of the populace does suggest slaves were less likely.

Some weaving swords not associated with graveyards also have been found, though less frequently. A single weaving sword was located with a helmet in a rubbish pit at the Coppergate dig in York. This sword has a blunted blade and parallel, striated wear patterns from use.[290] Examination of the forging techniques suggest that the beater was built for the purpose of weaving, instead of being a recycled weapon.[291] Another sword beater not associated with grave goods is a pattern welded iron weft beater found in Sunken Featured Building 7 in West Stow. It is believed that this weaving sword started out as a weapon, but was adapted by adding a second grip or tang to the tip of the blade.[292]

[286] Hoffmann, *Warp-Weighted Loom*, p. 281.

[287] Hoffmann, *Warp-Weighted Loom*, p. 281.

[288] Harrington, *Aspects of Gender Identity*, p. 45.

[289] Hyer and Owen-Crocker, 'Woven Works', p. 166.

[290] Walton Rogers, 'Sword-Beater', p. 882.

[291] Walton Rogers, 'Sword-Beater', p. 887.

[292] Leahy, *Anglo-Saxon Crafts*, p. 69.

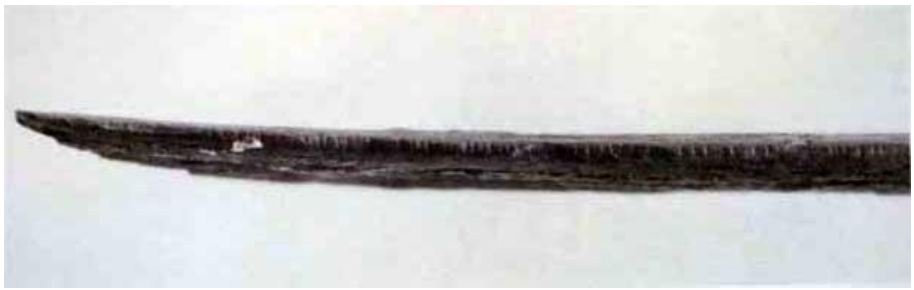

Figure 43. Viking era wood weaving sword with visible striated wear patterns from Gården under Sandet, Greenland. Image from *Woven into the Earth*, p. 57 (fig 26).

The usefulness of weaving swords for lighter fabrics has been a debated topic among modern weavers who use the tool. Because of the work of Hoffmann, the ability to weave heavier fabrics with sword beaters is well known. Eva Andersson agrees, stating that iron beaters pack the weft tighter and demonstrate the capacity for pushing through fuzzy yarns better than other beaters.[293] In her work weaving cloth for reconstructing medieval garments, Else Østergård discovered that a sword beater with a long handle reduces stress on the weaver's wrist. She also found that a lighter weaving sword is better for producing lighter fabrics, which is to be expected.[294] However, Østergård believes to really compact a weft for heavy fabrics, a small comb works better than a weaving sword of any weight.[295] In all likelihood, it depends on the preference and training of the weaver more than the tools themselves.

[293] Andersson, 'Tools for Textile Production', p. 28.

[294] Fransen, Nørgaard and Østergård, *Medieval Garments*, p. 28.

[295] Fransen, Nørgaard and Østergård, *Medieval Garments*, p. 27.

3. Approaches

'…Unfortunately the published reports mostly have not given us adequate details to see just what the ancient weavers were up to.'

Elizabeth J. Wayland Barber, *Prehistoric Textiles*, p. 96

Exploring the known archaeology, linguistics and art of the warp weighted loom is very useful for understanding the history of warp weighted looms. Artistic renditions show what the loom may have looked like. Archaeology assists with identifying associated tools. Linguistics helps fill in the gaps left by the other disciplines. However, to truly understand a tool, it helps to know how it was used.

It seems unlikely that approaches and techniques for weaving on this loom type were consistent throughout all times and cultures for which it was the primary cloth making tool. At the moment, the best available evidence for weaving processes come from the work of Hoffmann and Grostøl which shows the work of seven women weaving a single type of weave with very traditional patterns. Other solutions and possibilities must be sought out if the loom is to be truly understood.

As no one individual has the capacity to envision all solutions, it seemed a reasonable idea to contact modern weavers with familiarity working with a warp weighted loom to assist in discovering answers to certain questions. This group of people was also intended to be a useful base for exercises in experimental archaeology. Their experience would insure a more accurate result than someone using a loom for the first time or otherwise unfamiliar with weaving techniques, and allow for concurrent running experiments if so desired. Also, their numbers would be a way to determine the usefulness of tools currently associated with the warp weighted loom, such as weaving swords, 'pin beaters', and particular loom weight

types, due to differences in approach, physiology, and expectations, as well as considering alternate avenues of questioning and problem solving.

To document a possible range of techniques for using warp weighted looms, a number of modern weavers with some experience using this type of loom were located and given a questionnaire to complete. The possibility of posting the questionnaire on websites set up specifically for the distribution and collection of surveys was investigated as a method to increase the ease of completing the questions, thereby increasing the amount of data collected. However, the limitations of investigated sites made the option untenable.

In order to expedite getting the questionnaires to possible respondents and receive completed versions quickly, a questionnaire was posted on a publicly accessible website.[296] In the first two weeks after the activation of the online version of the questionnaire, the site received one hundred and ninety five 'hits', with activity from countries as diverse Sweden, Canada, France, Italy, Germany, Finland and Estonia. Within that time frame twenty one questionnaires were returned. The questionnaire was investigated 1,637 times by the time the survey was closed on 31 January 2012. Whether this was the number of individuals who actually were weavers or saw the questionnaire is indeterminate. It is likely that many of those individuals were simply exploring warp weighted looms. In the end, forty four questionnaires were completed and returned; fewer than was hoped for but more than expected.

The intention of the questionnaire was to develop a pool of individuals with access to and experience with warp weighted looms. These people would then be approached with questions about the loom that would arise during the research phase of this thesis. Unfortunately, the current rules requiring post graduate work in the United Kingdom to be completed within three years combined with the unexpected

[296] < http://warpweightedweaversquestionnaire.blogspot.co.uk> [accessed 27 May 2012].

lack of survey work did not allow for follow up with the intended approach. Still, it is an interesting study regarding the people who choose to work with the primitive loom, including their expertise and abilities, which might be a useful base for further research at a later date.

Survey methodologists provide little guidance for the creation of questionnaires because every discipline has its own distinct needs that are further defined by the specific information sought. Therefore, the general approach was informed by Michael Ornstein's article 'Questionnaire Design'.[297] The questionnaire was divided into three parts: a twenty question multiple choice section for quantifiable data, a short answer section to add detail to the information from the previous section, and a request for an interview along with information about how and when to contact the respondent to elicit further details.[298]

The first section of the questionnaire was multiple choice to allow for a compilation of quantifiable data regarding tool use, experience level, and reasons for choosing this particular loom type. The second section requested short answers from the respondents to expand upon the quantifiable data, eliciting more detail than possible with the multiple choice format. A few of these individuals volunteered to be interviewed to add more depth to the provided information about their experience with these looms.

The multiple choice section was designed to be quick to answer, as people tend to be more willing to respond to a short survey, and answers are less likely to be vague or conflicting.[299] Some of the reasoning behind individual choices of tool use was gathered through this method. Also sought were responses about why the

[297] Michael Ornstein, 'Questionnaire Design', *Current Sociology* 46 (1998), pp. 7-47 (pp. 25, 43).

[298] The questionnaire responses are located in the appendix.

[299] Ornstein, 'Questionnaire Design', pp. 24, 41.

weaver chose to work on this type of loom, and where she learned how to work on the warp weighted loom.

Information about where and how the weaver learned to use the warp weighted loom, whether self-taught using available written sources, or if there was an instructor was desired to demonstrate the basic avenues of learning available to the student. The weaver was asked what sort of unexpected difficulties arose while working and how such problems were solved. Other questions involved experiential information about tools archaeologically associated with the loom. Sizes and shapes of warp weights and their effect on weaving was explored. The use and choice of weft beaters, such as pin beaters, combs and sword beaters, was also examined to discover whether experience matched with academic literature.

Information was sought about length of time working with the loom and number of pieces of cloth woven, with the hope of a wide range of experience in the respondents. Experienced craftsmen have a larger range of available techniques to call upon for problem solving, and less experienced individuals tend to attempt more creative solutions. Alternatively, a skilled individual may have performed a task so many times it has become muscle memory, and may not be able to explain the process adequately. A novice might still be thinking about every action, with the intentions and consequences that inform the decisions that lead to it.[300]

Questions relating to where the student learned to use the warp weighted loom and which other types of textile skills were known to the respondent were designed to assess the knowledge base accessed while working with the loom. A student is more likely to follow the example of a teacher with some modifications, whereas someone working with diagrams from a book is more likely to use the skills already acquired in other textile experience to bridge any gaps in information. A

[300] Ingold, *Perception of the Environment*, p. 295.

basic understanding of the dynamics of yarn at the level of muscle memory would also inform the learning process.

Tim Ingold discovered that diagrams demonstrating textile techniques are useful as reminders of already known movements, but not helpful in teaching previously unknown techniques.[301] Craftwork is, after all, accomplished in four dimensions: height, depth, breadth and through time. The wider the knowledge base in the manipulation of yarns, the more likely the weaver is to understand the dynamics and nuances of the medium.[302]

Understanding that the forces with which thread or yarn tends to function also affects the technique of the weaver, a set of questions was developed to determine possible factors that would affect the weaving, such as the differences in tensions between industrial spun yarn and hand spun yarn, the effects of dyes, or possible responses to different types of fibres.[303] Other possible factors such as weight shape and beater tool were also considered and added to the questionnaire.

Tool choice was another consideration. If a weaver was interested in historical accuracy based in a specific culture, it would be reflected in the choice of beater, materials chosen for the weights, yarn type for the current understanding of the loom, and the literature consulted. If the primary interest was in proof of concept, the loom might be made of plastic piping, weights from metal hardware store accoutrements such as washers or nuts intended for large bolts, and beaters made from objects at hand such large butter knives. An individual interested in historical accuracy would seem more likely to find techniques and solutions to problems that would reflect traditional techniques because the appropriate tools influence

[301] Ingold, *Perception of the Environment*, pp. 357-8.

[302] Ingold, *Perception of the Environment*, p. 315.

[303] Ingold, *Perception of the Environment*, p. 345.

movement, though proof of concept weavers would still provide interesting and useful information along with creative solutions to weaving problems.

The eight question short answer section was designed to elicit further information on some of these topics. The intent was to gather more detailed information in a quick to answer format, as well as assisting with question design for the interview process. The final question of this section was a request for permission to interview the subject, which was intentionally placed last to find individuals willing to spend more time to complete the entire questionnaire, and thereby more likely to be willing to submit to an interview. Also, placing the request within the questionnaire eliminated the need to contact all respondents, and increased the possibility for a productive interview due to willingness to participate on the part of the weaver.

Of those forty four respondents, ten were able to be interviewed. Topics discussed in the interviews, as well as information from the short answer section of the questionnaire, are incorporated into the questionnaire analysis to add depth and breadth to the information gathered through the multiple choice section in the analysis chapter.

To locate these weavers, likely connection points where people who practiced fibre crafts, whether as a paid vocation or hobbyists, were approached. Among those contacted were weaving guilds, online forums for fibre crafts and medieval historians, re-enactment or living history societies, as well as printed and online publications representing similar interests.

The most obvious starting point was the Yahoo Group web board titled ‘WWLoom: Warp Weighted Loom Discussion Group’. With a membership of one hundred and ninety seven at the time of this writing, the group was specifically created to exchange information, ask questions, and discuss research about the

loom.[304] A request for individuals willing to answer the questionnaire developed specifically for this group was posted on the web board with permission of the group's moderators.[305]

Because it was unlikely that all weavers who use the warp weighted loom were aware of or regularly checked the web board, the decision was made to contact more generalized fibre craft enthusiasts to locate more weavers. The website Ravelry™, which boasts over four million members worldwide at the time of writing, was utilised for this purpose.[306] System administrators for the entire website, which supports a great number of individual message boards with specific topics, were approached for permission to post a request for individuals willing to answer the questionnaire. At their suggestion, the administrators of twenty six of the several hundred message boards on the website were then contacted. These particular message boards were chosen from a search of the website based on a stated focus in the categories of history, re-enactment and/or weaving. Once permission was obtained from the individual message board moderators, the request for respondents was posted. The request included information about the questionnaire, the website in which it was posted, as well as the personal contact information of the researcher for the use of respondents with concerns or questions about the research.[307]

Print options were also explored. Specifically tailored email was sent to Skirmish magazine, a publication for re-enactors; the Weaver's Guild of the United Kingdom; and the newsletter editors for the Society of Creative Anachronism (SCA), a re-enactment/living history association with more than sixty thousand

[304] < http://groups.yahoo.com/group/WWLoom> [accessed 27 May 2012].

[305] The task of a moderator is to determine whether a post is appropriate for and in keeping with the intentions of the web board.

[306] <www.Ravelry.com> [accessed 27 May 2012].

[307] < http://warpweightedweaversquestionnaire.blogspot.co.uk> [accessed 27 May 2012].

members; The Handweavers' Guild of America; and the publications Spin-Off and Handwoven, asking if a request for warp weighted weavers could be published, and whether such a request would be charged at advertisement rates.[308]

Re-enactors, or those involved with living history, proved to be a particularly rich source for historically accurate craftwork, reproductions and craftsmen. This is due to the interests of those involved, who wish to understand history through personal experience.[309] Serious re-enactors base their work in the understanding gleaned from details available through archaeological and documented information, striving for as much historical accuracy as possible based on current knowledge from academic research as well as the knowledge base of other craftsmen working in similar fields.[310] These living historians choose to spend their time and money researching and working with the materials and developing techniques of previous eras and cultures because they have a passion for history. They also report a great deal of personal satisfaction stemming from the process of creating objects with their hands.[311]

Groups specifically oriented to periods and cultures before and around 1000 AD with living history experience were contacted.[312] Email specifically tailored for each group was sent to twenty four separate groups and seven umbrella groups from the list. Included in the email was information about the author and the questionnaire, the reasoning behind the research, and a request to circulate the

[308] www.sca.org.

[309] Beth Goodacre and Gavin Baldwin, *Living the Past: Reconstruction, Recreation, Re-enactment and Education at Museums and Historical Sites* (London: Middlesex University Press, 2002), p. 133.

[310] Jonathan Lamb, 'Historical Re-enactment, Extremity, and Passion', *The Eighteenth Century* 49 (2009), p. 248.

[311] Crang, 'Magic Kingdom', p. 419.

[312] Christina Petty, 'Re-enactment', *Encyclopaedia of Medieval Dress and Textiles*, ed. by Gale R. Owen-Crocker, Elizabeth Coatsworth, and Maria Hayward (Leiden: Konkinklijke Brill, 2012), pp. 444-451.

information among the members of the group. Also contacted were the leaders for each of the nineteen subdivisions, labelled 'kingdoms', of the SCA, the first and largest organised living history group.[313]

To attract weavers not associated with living history, notices were also posted on LinkedIn, a website designed to connect professionals in various fields, on the web board for Experimental Archaeology.[314] The Weaver's Guild of America and The Association of Guilds of Weavers, Spinners and Dyers were also contacted with the request to post information about the questionnaire to their members.[315]

Asking the warp weighted weavers themselves to assist in locating other practitioners has shown to be an effective approach. A Dark Ages history professor from the University of Thessaloniki received the explanatory paragraph which included the website address, translated it into Finnish and sent the translation to her colleagues in Northern Europe. This was indicated by fact that the original paragraph and the translation were found at the bottom of the email containing the questionnaire. A gentleman noticed the request on LinkedIn and forwarded the information to a related Experimental Archaeology board on Facebook, one of the largest social networking sites currently in operation.[316] A German blogger posted the questionnaire on her website, and another gentleman linked the website address to the appropriate webpage on his living history group's website.[317] These are just a few of the more interesting examples.

[313] Petty, 'Re-enactment', p. 446.

[314] <www.linkedin.com> [accessed 30 Oct 2012].

[315] <http://www.weavespindye.org> [accessed 1 Feb 2011]; <http://www.onlineguildwsd.org.uk> [accessed 4 Feb 2011]; <http://www.wsd.org.uk> [accessed 7 Feb 2011].

[316] www.facebook.com/pages/Experimental-archaeology/105600229473865.

[317] http://www.darkcompany.ca.

The warp weighted loom was a tool that was used in creating the cloth that surrounded the lives of people for a considerable span of time. Because many of the techniques for working on this loom type have been lost, individuals interested in understanding the use of the loom and how it affected daily living for the people who wove on it have had to reconstruct the loom and its associated tools, and reinvent the techniques to use it. Gathering together the knowledge of these weavers through quantifiable data and interviews may increase the understanding of a process that was of vital importance to Northern Europe for millennia.

4. Re-enactors, Living Historians, and Historical Interpreters

The majority of respondents to the questionnaire associated themselves with living history or re-enactment groups. Most academic writing relating to these people focuses on either American Colonial groups or their usefulness for museum studies. As there is little literature regarding such organizations working on or with early medieval topics, or as useful subjects for experimental archaeological topics, a discussion of these groups is necessary.

Re-enactment and living history are among the terms used to describe the comparatively recent movement of people with an approach to understanding history by attempting to replicate a time frame or culture of particular interest through costume, experience, and experiment. According to the *Oxford English Dictionary*, the first print usage of the term 're-enactor' to refer to a living person as someone with this description was in 1975, in a newspaper published in Maryland in reference to a man involved with recreating a battle of the American Civil War.[318]

The usage of the terms 're-enactor' and 'living historian' can be somewhat confusing when dealing with the communities concerned with understanding history through experience. Within the most specific parameters, a re-enactor is an individual who portrays a particular documentable historic event or person, a living historian is someone who represents a culture without a focus on a specific historically known person or event, and a historical interpreter dresses appropriate to the culture or event they are discussing without an attempt at representation.

Re-enactors specialize in historic events such as the Battles of Hastings and Stamford Bridge, or the march of the Anglo-Saxon forces under the command of

[318] 'Re-enactment', *Oxford English Dictionary* <www.oed.com> [accessed 4 Oct 2012].

Harold Godwinson that occurred between the two battles.[319] These events are re-enacted or reconstructed with as much historical accuracy as possible, with many hours of research spent on costuming details, investigating life histories of those involved and determining battle tactics. The reconstructed events are often held on the same ground as the original event, or at least as closely as can be arranged.[320]

Individual re-enactors can be chosen to portray prominent historical figures involved in these events. Persons re-enacted must be known individuals with extensively researched backgrounds, including appropriate costuming and life details.[321]

The concept of an individual staying 'in character' with the persona or historical figure being portrayed has been attempted by re-enactors.[322] They answer questions put to them by the public using only the experiences available to a tenth century Viking, for example, pretending to have no knowledge of history or technical advances since the time frame being portrayed. Some events closer to the current time such as the open air museum town of Colonial Williamsburg in America even try staying within the limitations of language usage of the time.[323] The practice has since been discarded as it made communication with modern audiences under most re-enactment situations difficult and frustrating. It is now common practice to interact with the public using modern language and analogies that allows for better understanding.[324]

[319] < http://www.telegraph.co.uk/news/uknews/1530944/Long-road-to-Hastings-as-Saxons-march-to-battle.html > [accessed 4 Oct 2012].

[320] Goodacre and Baldwin, *Living the Past*, p. 2.

[321]Jay Anderson, *Time Machines: The World of Living History* (Nashville, Tennessee: The American Association for State and Local History, 1984), p. 31.

[322] Scott Magelssen, *Living History Museums: Undoing History Through Performance* (Lanham, Maryland: Scarecrow Press, 2007), pp. 12-13.

[323] Magelssen, *Living History Museums*, p. 15.

[324] Magelssen, *Living History Museums*, p. 16.

Living history is the preferred term for the demonstration and performance of daily activities associated with a historical time frame or culture.[325] As much, if not more, research is necessary to demonstrate the lifestyle of an average individual, with time expended learning the crafts necessary for existence and known for the culture.[326] Authenticity and historical accuracy is so important to those involved that to wilfully ignore known facts and practices causes such an individual to be disassociated with some of the mainstream groups.[327]

Seldom do people associated with living history portray known historic figures, except during specific events; instead they often adopt culturally appropriate names and create realistic background stories based in extensive historical and ethnographic research.[328] These invented individuals are called personas to separate the characters from the individuals portraying the culture and known historic figures. They also differ from characters in theatre and film, because specific speeches or other memorised material is not used, but conversation and interaction develop naturally from the environment surrounding the individual.[329]

Some museums and organized events use the term 'historical interpreter' for costumed individuals with the responsibility to interact with the public for the purposes of education. These people do not attempt to create a persona, but generally speak as themselves using whatever source material is available to them to enhance understanding, including literary, folklore, art history, drawing on personal

[325] Goodacre and Baldwin, *Living the Past*, p. 1.

[326] Crang, 'Magic Kingdom', p. 420.

[327] Anderson, *Time Machines*, p. 192.

[328] Crang, 'Magic Kingdom', p. 419.

[329] Magelssen, *Living History Museums*, p. 111.

experience to communicate the history of the time frame in question.[330] They still dress in the appropriate costuming, to further educate their audiences, and for the draw it provides to the general public.

People associated with organised groups or societies such as *The Vikings!* or *Regia Anglorum* often find themselves involved with re-enactment, living history and/or historic interpretation depending on the venue or intent behind the event. Therefore, they often use the terms interchangeably, some content to be called by any of the terms. Those professionally attached to museums are somewhat more particular, preferring the terms living historian or historical interpreter. The intention is to create separation between themselves and those associated with re-enactment, which has been perceived in the past as an expensive weekend hobby without much to recommend it for the purpose of educational value.[331] In practice, the lines between the three categories are blurred to the point it has become difficult for the layman to differentiate between them.

Regardless of the preferred term, people working in these capacities strive for more recognition from the academic community, as there has been a tendency not to credit the learning achieved through experiment and experience because it is difficult to describe and document in traditional academic formats, as was noted by Martin Cizuk.[332] Serious academic study of living history and re-enactment is comparatively recent, with the primary text on the subject, *Time Machines: The World of Living*

[330] Email communication with Kate Humble, Visual Experience Manager for The Royal Armouries, Leeds, on 29 October 2012.

[331] Elizabeth E. Peacock, 'The Contribution of Experimental Archaeology to the Research of Ancient Textiles', *The Roman Textile Industry and its Influence: A Birthday Tribute to John Peter Wild*, ed. by Lise Bender Jørgensen, Antoinette Rast-Eicher and Penelope Walton Rogers (Oxford: Oxbow Books, 2001), pp. 181-189 (p. 183).

[332] Martin Ciszuk, 'The Academic Craftsman', *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), pp. 13-15 (p. 13).

History by Jay Anderson, published in 1984.[333] The comparatively small body of literature tends to be based in the fields of museum or tourism studies, and is primarily concerned with the validity of the approach as a method of educating and engaging the public.[334] Academic historians have largely ignored the living history movement until the last few years, considering it a marginal cultural phenomenon.[335]

Crang questions the attitude of academics he spoke with while working toward his own PhD:

> 'But as re-enactments must justify their often militarist trappings, academics need also to explain their intense hostility to re-enactment. While doing this research, the author encountered persistent scepticism from colleagues, at a most visceral level. It is true that much of the attention to detail is almost obsessive over minutiae. But I am forced to ask myself whether researching a Ph.D., as I was, provides the most Olympian height from which to sneer at this? The real doubts seem to concern the way in which the past is enjoyed. There is an emotional and empathetic bond with what is depicted, and this seems to provoke a hugely intemperate response from academics that overlooks the self-reflexivity of the re-enactors and invokes the superiority of a rational understanding of the past. But one has to ask then whether this dismissal of all "emotive" and "affinitive" knowledge is not dangerously phallogocentric, and whether rational research does not itself also form a way of "enjoying" the past. One must also question the dichotomization of entertainment and education implied and to what extent academia is an interested party in maintaining one side of the dichotomy as legitimate knowledge and cultural capital'.[336]

[333] Jay Anderson, *Time Machines.*

[334] The majority of the debate falls between those who support living history as a valid historical approach that is comparable more traditional forms of history and historiography (see the works of Jay Anderson and Scott Magelssen) and those who criticize the method as being misleading to the public due to inaccurate or incomplete historic portrayal, with improbable expectations. At some point, the critics argue, historical accuracy becomes impossible because compromises must be made by the museum between historical fact and modern conveniences, safety concerns for all parties involved, and past versus modern political reality such as the portrayal of slavery (see the work of Mike Crang, Robert L. Janiskee). This area of study seems to be primarily an American Studies research concern, as most of the museums studied by these scholars are found along the eastern seaboard of the United States. Re-enactment societies that have been studied tend to be focused on the American Civil War (1861-65), or open air museums representing Colonial America, and therefore not relevant to this research.

[335] Vanessa Agnew, 'History's Affective Turn: Historical Reenactment and its Work in the Present', *Rethinking History: The Journal of Theory and Practice* 11.3 (2007), pp. 299-312 (p. 299).

[336] Crang, 'Magic Kingdom', p. 422.

Lise Bender Jørgensen challenges the idea that valid knowledge in the academic world, as far as the western tradition is concerned, is only that which can be verbalized. In her article 'Textiles of Seafaring: an Introduction to an Interdisciplinary Research Project', she also puts forward the idea, proposed by Gilbert Ryle, of two basic types of knowledge: knowing about something, and knowing how to do something.[337] It is sometimes much more difficult to express how something is done in exacting detail in words and diagrams, while demonstrating the practice conveys more useful information in a shorter amount of time and with a better level of communication.[338] Living historians and craftsmen seem to understand this instinctively as they prefer to show rather than simply tell to educate themselves and others.

Bender Jørgensen also discusses the thought that people know more than words are able to convey, which she attributes to Michael Polyani. The two ideas, together with a great deal of experience, create what Bender Jørgensen calls 'pottery sense', or the ability to identify an object or technique by innate, inexpressible knowledge, and a deep understanding that is expected of experts. This 'pottery sense' is highly valued by museums, the media, and archaeological excavation teams, as well as other fields of study.[339] It is also necessary for real understanding of artefact use and creation, providing more accurate results for experimental archaeology.

Because there is no written documentation explaining the use of warp weighted looms dating to the time when this loom type was the primary tool for cloth creation, the 'pottery sense' of weavers is a useful source of information,

[337] Lise Bender Jørgensen, 'Textiles of Seafaring: an Introduction to an Interdisciplinary Research Project', *Northern Archaeological Textiles: NESAT VII*, ed. by Frances Pritchard and John Peter Wild (Oxford: Oxbow Books, 2005), pp. 65-69.

[338] Ingold, *Perception of the Environment*, pp. 357-8.

[339] Bender Jørgensen, 'Textiles of Seafaring', pp. 65-69.

bridging the gap between the archaeological evidence for the loom and the textiles created using the known artefacts. Using the little available Classical and Medieval art depicting warp weighted looms, the few contemporaneous literary sources, folklore, and documentation of early twentieth century warp weighted weavers, modern weavers have attempted to reconstruct the loom and textiles thought to be produced by it.

To gain a better understanding of the creation, set up, and use of warp weighted looms, it seemed reasonable to attempt to locate individuals with this kind 'pottery sense' or in depth understanding of early medieval weaving techniques. These people already practice experimental archaeological techniques, whether knowingly or not, of the very specific type necessary to forward the research. As the required tools to practice these weaving techniques are not widely available, finding individuals with access to either the tools or those who can make them was among the limiting factors for locating focus groups in which to search for weavers with experience using the warp weighted loom.

Though several other approaches and lines of inquiry were followed, the most productive way to contact most of the individuals who fit these criteria proved to be through living history or re-enactment societies. An examination of the history of these groups demonstrated a long standing desire amongst the membership for more historical accuracy and understanding that created a sizable number of highly educated craftsmen, some of whom focused on textiles.

4.1. Living History Societies with an Early Medieval Focus

Though the tendency to look back to the past as something of a golden era to be reproduced and celebrated has seemingly always been a part of the human psyche, the history of modern medieval re-enactment societies dated back to the first gathering of The Society for Creative Anachronism (SCA) in May of 1966.[340] Officially formed under California statutes for non-profit organisations in 1968, the SCA now boasts over 30,000 paying members and more than 60,000 participants worldwide, making it the largest active living history society. The group was named by author and founding member, Marion Zimmer Bradley, for the purpose of filling out the legal paperwork. That same year, a branch of the society was formed in New York City, beginning a worldwide movement that currently has affiliated groups in Australia, Canada, Europe, New Zealand, South Africa, South Korea, and the United States, separated into the nineteen 'kingdoms' discussed earlier.[341]

Each member creates a historically plausible persona from any known culture from the seventh to the seventeenth centuries, researching and constructing varying levels of historically accurate costume, with an appropriate name and background: historical and well known literary figures are not permitted, neither are invented cultures.[342]

Members of the SCA study and take part in a variety of activities, including costuming research, bead work, sewing, and other fibre arts, as practiced during the individual member's chosen time period. As with any organisation of this size, the level of dedication varies from the merely interested to the serious scholar. Nearly

[340] Petty, 'Re-Enactment', p. 446.

[341] Agnew, 'History's Affective Turn,' p. 302.

[342] Suzanne Barber, 'Negotiating a Shire: The Transformation of Local Values in the Society for Creative Anachronism', *Folklore Forum* 41.3 (2011), online publication with no pagination.

fifty years of organisational experience has given rise to the Laurels program, an acknowledgment which encourages excellence in research and historical accuracy for the arts and sciences as understood by available research in the chosen culture of the individual participant. More active members spend a great deal of time and resources creating their persona over the course of years, often becoming self-taught in required fibre arts, as desired costume pieces can be difficult to purchase.[343] Such individuals then become teachers for newer members with an interest in the same historic era.

The unofficial motto of the SCA is 'the Middle Ages as they should have been', a saying between members to indicate a lack of undesirable historic elements like religious persecution, open pit sewers, lack of bathing facilities, and disease. Corrective lenses such as glasses, modern prosthetics, and safety goggles, among other modern conveniences are also allowed, which, in conjunction with the motto without proper context, is often the cause for misjudgement among the academic community concerning the seriousness of scholarship undertaken by some of the membership of the organization.[344] The group has proven to have fostered a good deal of valuable research, especially in the area of medieval crafts.[345]

Four times a year, the SCA publishes *The Compleat Anachronist*, with the first issue produced in 1982. A review of the index of articles demonstrates a long

[343] Details for the Laurels program can be found on the website <http://www.sca.org/docs/index.html> [accessed 12 November 2012], on page 21 of the attached document.

[344] < http://www.sca.org/officers/chatelain/sca-intro.html > [accessed 12 Dec 2010].

[345] Will McLean and Jeffery L. Singman, *Daily Life in Chaucer's England* (Westport, Connecticut: Greenwood Press, 1995), p. 221.

standing interest and the scholarship available on textile topics. Articles on Viking textiles and weaving techniques date back to 1991.[346]

Founded in 1971 as a response to the SCA, *The Vikings!* founding members wanted to focus on more historically accurate settings and weaponry. Limiting personas to a more closely defined era, the years 790 to 1066 AD, allows the group as a whole come to a better understanding of particular medieval cultures because of the concentration on a specific historic era. Research is shared among the members in a way not possible with the wide interests of the SCA. Modern items such as watches, glasses, and plastics are dispensed with entirely and replaced with historically appropriate accoutrements or eliminated. Modern conveniences that can be hidden from view, such as contact lenses or medical braces, are permitted. Originally organised under the title The Norse Film and Pageant Society, *The Vikings!* are Britain's oldest Dark Ages society with more than forty five official groups in Canada, Ireland, Italy, Netherlands, United Kingdom, and the United States. Current membership records indicate over 1,500 participants.[347]

Despite the name, *The Vikings!* members re-create several cultures that existed between 790 and 1066 AD, including Saxon, Norman, and Celtic, as well as Viking. Individual members often have costuming and personas for several of the different cultures, and are able to adapt their costume, gear and persona as required by the occasion. Some members with experience perform as known historical figures for specific re-enactment events or to serve the educational needs of schools, film, and television programs.[348]

[346] < http://www.sca.org/ca/issues.html > [accessed 9 Oct 2012]. Some issues are available on their website, and others can be ordered, but a few of the older issues are out of print and therefore no longer available.

[347] < http://www.vikingsonline.org.uk > [accessed 15 Dec 2010].

[348] < http://www.vikingsonline.org.uk > [accessed 15 Dec 2010].

The Vikings! are often employed for the television and film industries, where they are appreciated for providing historically accurate costuming and extensive knowledge of the time period. They also work with English Heritage to add interest and points of communication and education with the public at places like the Jorvik Viking Centre in York, England, and others, creating live displays and battle re-constructions. They are also involved in re-enacting historically important events, such as the Battle of Hastings, which is re-created every year on or near 14 October on site at Battle Abbey in England.

The Vikings! publishes *The Runestaff,* a society newsletter that includes articles written by the membership. Several articles on the website cover Anglo-Saxon textiles, and Viking and Anglo-Saxon costume with details provided about archaeologically known examples of weave patterns.[349]

Vikings – North America started as an associated branch of *The Vikings!*. Members operate a permanent re-created Norse settlement outside of Knox City, Missouri, called Ravensborg, which is under expansion. Ravensborg exists because the members wanted a site with appropriate buildings set apart from modern conveniences. The setting allows re-enactors and experimental archaeologists access to more nuanced conditions such as how natural lighting and weather conditions affect both the weaving and the weaver.[350] Several women have set up and worked with the warp weighted loom for extended periods in the longhouse, noting how the venue has affected the work.

On five acres of privately owned land in the countryside, the settlement currently consists of a long house, a cookhouse, a blacksmithing shed, and a pond

[349] < http://www.vikingsonline.org.uk/resources/articles.htm > [accessed 1 Oct 2012].

[350] < http://www.ravensborg.org > [accessed 23 May 2013].

graced in good weather with an accurate, working reconstruction of a Viking longboat. Basic earthen fortifications surround the site. There are plans for a weaving shed, more earth works and walls surrounding the settlement, among other improvements. Ravensborg is open to the community and schools for educational purposes at various times during the year. Large gatherings for *Vikings – North America* also occur here, where the members authenticate their costuming and craft skills with the appropriately trained and experienced officials, and to expand their knowledge base, as well as educating the public.[351]

Regia Anglorum was founded in 1986 as a response to *The Vikings!*. Comprised of people wishing for a more confined geographical area, members portray the lives and times of the people who lived in the British Isles. The historical time line focus of the society is from the reign of Alfred the Great to the death of Richard the Lionheart. The society boasts forty one groups in Britain and North America: the cultures represented are Norman, Anglo-Saxon, and Viking. The group has more than six hundred members.[352]

More than eighty film productions have used members of *Regia Anglorum* as extras in productions that vary from serious documentaries to music videos to advertising. Members of the society can be seen in the documentaries *Michael Wood on Beowulf, Blood of the Vikings, 1066: The Battle for Middle Earth*, and *A History of Britain.* Often hired for detailed historical knowledge as well as providing accurate costuming, members have been hired as consultants to portray the culture more accurately.[353]

[351] < http://www.ravensborg.org > [accessed 14 Oct 2012].

[352] < http://www.regia.org > [accessed 17 Dec 2010].

[353] < http://www.regia.org > [accessed 17 Dec 2010].

Regia Anglorum is also an Associate Sponsor of the British Museum. The ability of craftsmen in the group is of sufficiently high quality and level of professionalism that artefacts created by members have been requested by museums for display.[354]

The society is also involved in building a permanent settlement on three acres of land in Kent, called the Wychurst Project. Intended as a full scale replica of a defended manorial burgh, it currently boasts a long hall, two small cottages, and a flooded ring ditch and bank, and two hundred and twenty meters of palisade that encloses an acre of the site. Gatehouses are under construction, and other improvements are in the planning stages. The site has already been used by the television and film industry as a set for productions.[355]

Two publications are issued by the society. *Chronicle* is the regularly published journal. *Clamavi,* a newsletter, has occasional distribution. The website for *Regia Anglorum* has articles on textiles, sprang, tablet weaving, and other textile and textile tool related subjects.[356]

Many other smaller groups have been formed over the time since the advent of these societies, based on the needs and intentions of the membership. Some are organised based on geographical distance, to make travel to and from events and meetings more convenient for the members. Others wish to place their focus on education and attending educational functions as special 'hands on' lecturers, bringing collections of specifically created artefacts associated with a particular skill or culture, to further general understanding of the medieval era.[357]

[354] < http://www.regia.org > [accessed 17 Dec 2010].

[355] < http://www.wychurst.com > [accessed 30 Dec 2010].

[356] < http://www.regia.org/listings.htm#crafts > [accessed 16 Oct 2012].

[357] < http://www.vikingasaga.co.uk > [accessed 17 Oct 2012].

An interest in accurate costuming and the performing of culturally accurate crafts are a common factor among these groups. Often, this inclination creates an interest in various types of weaving and weaving tools for some members, as is evidenced by photographs on many of the websites maintained by living history societies. A complete listing of the numbers and names of these organisations is difficult to obtain, though attempts have been made.[358]

One of the advantages of approaching re-enactment and living history societies to attempt to locate warp weighted loom weavers is the tendency for a great deal of communication amongst the groups, which is helpful when a particular skill set is sought. Individual re-enactors, especially those with a passion for the work, often belong to several organisations. Many living history groups also congregate at large events, allowing for an exchange of experience and information.

Most living history societies boast a wide range of daily skills, from striking coins to cooking using known recipes from the era depicted. Sometimes, historic buildings or museums such as Barley Hall in York bring in living history interpreters with the intention of understanding how the spaces were lived in and how the craftsmen known to have lived there worked. Peter Addyman, writing in 2000, noted that bringing in the interpreters 'valuably reminded archaeologists and historians of the limits of inference from their evidence and rapidly demonstrated lacunae in knowledge'.[359]

For many re-enactors, the knowing the process of the type of work practiced is as least as important, if not more so, than the finished product.[360] Appropriate tools

[358] Petty, 'Re-enactment', pp. 448-451.

[359] Peter Addyman, 'Barley Hall: An Experiment in Archaeological Interpretation', *Public Archaeology* 1 (2000), pp. 85-87 (p. 86).

[360] Crang, 'Magic Kingdom', p. 420.

for the craft are purchased, traded for, or sometimes created by the craftsman. Where possible, depending on the level of dedication of the individual and availability, accurate materials are also sought to create an authentic experience and understanding of the craft, which in turn develops a level of knowledge for the culture surrounding the craft unattainable any other way.[361] Sufficient interest from living history groups in the ability to acquire the necessary materials and tools lead to the creation of The Original Re-Enactors Market in 1990, which meets yearly in the United Kingdom. The market boasted one hundred and twenty one vendors from several countries in March 2012.[362]

With the wide range of crafts available within the community, and a widening international market, those interested in textile work either know how to make specialised, historically accurate tools, where to buy them, or how to find someone who can craft what is needed. Craftsmen can also assist the academic community by identifying archaeological artefacts as particular tools through familiarity with the construction and possible uses for tools in their area of expertise.[363]

Experimental archaeology has become an important part of modern archaeology.[364] With such a large population of volunteer researchers specializing in understanding the past through experience, the re-enactment and living history societies seemed a reasonable starting point for locating the weavers necessary to this research.[365] Differing levels of experience and the likelihood of multiple

[361] Goodacre and Baldwin, *Living the Past*, p. 133.

[362] < http://reenactorsmarket.co.uk > [accessed 17 Oct 2012].

[363] Knudsen, '"Translating" Archaeological Textiles', p. 106.

[364] Peacock, 'The Contribution of Experimental Archaeology', p. 181.

[365] Lise Bender Jørgensen, 'Ancient Costumes Reconstructed: A New Field of Research', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*,

individuals with various solutions to research questions posed are more likely to be found in this pool of research subjects. Access to resources that more closely approximate historical conditions such as Wychurst or Ravensborg can add information that may not be otherwise considered, such as the effect of weather on yarns or the difficulties that natural light may create for the weaver. Understanding weaving processes and the time necessary for cloth creation emphasises the important role it played in the culture and daily lives of early medieval people living in the British Isles.[366]

NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), pp. 109-113 (p. 111).

[366] Schierer, 'Basic Considerations After 20 Years of Work', p. 99.

5. Questionnaire Analysis

First posted in January 2011, the website with the questionnaire officially closed on 1 January 2013. The website was set up to record the number of visitors to the website and the country of origin for each visitor. Traffic on the website indicated an intriguing level of world-wide interest in the subject of warp weighted weaving, with visitors from twenty five countries.

The largest numbers of visitors were from the English speaking countries, which was expected, as the website and questionnaire were in that language with no translations into another language. Visitors were noted from the United States of America, the United Kingdom, Canada, Australia, and New Zealand, all countries with large living history communities interested cultures from the medieval era. People from Ireland also visited the website; an unexpected development, as no archaeological evidence for warp weighted looms during the Iron Age has been found in that country, although they also have medieval living history communities which might explain the interest.[367]

Representative nations from Nordic countries with a long, unbroken tradition of warp weighted weaving were not surprising. Visitors from those countries included individuals living in Sweden, Finland, the Netherlands, and Norway. Interestingly, no one in Denmark, the country currently most active in experimental archaeology relating to textiles in general and the warp weighed loom specifically, investigated the website.

Other people who visited the website from non-English speaking countries that fall within the known range of the warp weighted loom during the Iron Age

[367] FitzGerald, 'Early Medieval Ireland', p. 14.

included Portugal, Russia, Germany, Spain, Israel, Italy, and France.[368] One respondent lived in Latvia at the time she sent in the questionnaire. The seven remaining countries from which individuals are known to have seen the questionnaire are India, Brazil, Columbia, Pakistan, the Philippines, Malaysia, and Japan. As far as it can be determined, these countries have no tradition of warp weighted weaving, so it seemed likely that these visitors to the websites have an interest other than the history of weaving for their geographical locations.

A wide range of weaving experience was hoped for, and obtained. Variety in experience was preferable because beginners often pay attention to different aspects of the weaving process and may ask questions about specific details or approaches more experienced weavers would take for granted or consider commonplace to their work. Certain movements or set up practices might become so ingrained in muscle memory that the experienced weaver may no longer think about the exact processes in use while working, whereas an inexperience weaver may be more mindful of the movement required. For those with long practice, the use of particular tools or procedures may have become common practice to the point where the original reasoning behind the usage or choice of the specific item has been forgotten. Beginning weavers often ask questions about these practices to better understand the work they want to achieve, and the reasons for performing certain tasks or actions.

Experienced weavers were sought because they were more likely to experiment with different approaches while using the warp weighted loom, having already reached a basic knowledge about the process of weaving with the tool. A higher level of experience also usually corresponds with a greater understanding of the associated tools, likely proving to be the difference between knowing if a particular loom set up or thought experiment is workable, which a beginner can

[368] Nielsen, *Kirkes Væv*, p. 39. This publication has a map showing the known boundaries of known archaeological artefacts related to the warp weighted loom in 1956 when Hoffmann did her research and the new boundaries as known by 1996.

determine, or whether a particular set up is practical or efficient, which may not be immediately apparent without such experience. Knowing the ‘feel’ of warp weighted weaving and having had more time to experiment, a practiced weaver can also determine a range of possible and/or probable uses of archaeological artefacts currently thought to be associated with the loom, such as the debatable ‘pin beaters’, weaving swords, and weaving combs. Determining the difference between what is possible and what is practical from the group of associated tools is also more likely given a more experienced weaver.

Individuals with experience using associated tools would also be helpful in interpreting wear patterns of archaeological finds and provide informed speculation about the placement of loom related finds in a dig site. Such people could also speculate upon the advantages, disadvantages and possible decisions that lead Anglo-Saxon people to choose to use particular tools, materials for weights, and the reasons behind fired and unfired warp weights, as well as other academic questions.

Seldom did the respondents document the exact number of hours they spent using a warp weighted loom, or other related textile work such as spinning yarn for weaving or finishing the fabrics. Likely, the respondents themselves do not know. This information is not necessary to allow someone to be useful when searching for answers for experimental archaeological questions, or setting up such experiments. When a person is approached for their expertise or experience, it is because of the acquired knowledge or their demonstrated body of work, not because such things have been carefully documented throughout a lifetime. It is not generally known how many hours it takes a person to become proficient at any paid craft like carpentry or as a musician, and yet these are the individuals sought to build a house or play a symphony, not those for whom the process is only a thought experiment.

The original intent of the questionnaire was to gather an experienced group of various abilities with the ability to answer questions that occurred during research on the history of the loom. The possibility of using these weavers for small experiments was also considered. Unfortunately, the unexpected lack of basic published surveys of the archaeological finds combined with the three year time constraint of the current system for granting post graduate degrees made the original intent untenable. Still, some interesting information can be gleaned, both concerning those interested in the warp weighted loom, and the continuing history of the tool.

Respondents to the questionnaire report personal histories with the warp weighted loom spread remarkably evenly across the number of years of experience. Fifteen of the forty four people indicate they have more than ten years of experience, fourteen individuals claim between five and ten years of experience, and fifteen respondents state they have less than five years practice with the warp weighted loom. The numbers suggest interest in weaving on the warp weighted loom remains steady over time, with roughly equivalent numbers of people learning the skill anew with every passing year.

However, the number of years a weaver has been associated with the warp weighted loom does not necessarily equate to that amount of experience with weaving on one. To differentiate between those who put a single warp on the loom and then have not finished it for whatever reason and those who really engage with the process and continued to practice weaving, the number of completed woven pieces was requested. The amount of weaving finished by an individual would also indicate more closely the level of practical experience that person had achieved.

While useful and important information, it is not necessarily an exact indicator of amount or variety of experimentation done by the weaver. As an example, respondent 41 reports four finished woven pieces over a span of more than

ten years, but also states that she has changed the arrangement and number of weights, the heddle tie ups, and has used different beating tools for experimental purposes on more than a dozen occasions. This demonstrates a desire to understand the possibilities of the tool, more than a need to have completed woven pieces.

Comparing the years of experience with completed work indicates the respondents who are likely the most accomplished warp weighted weavers. Of the fifteen respondents with more than ten years of experience only two finished fewer than three pieces. Eight of the respondents have only set up or warped the loom, many of whom only brought it out for display at public education venues or for their living history groups. Respondent 27 warped three looms for a film stage, leaving them with partially finished work as requested by the film company. She has not yet finished weaving a piece of cloth on the warp weighted loom, but has a fair amount of experience setting up the loom.

The same number of people finished a single piece as those who have not yet finished one, with eight respondents claiming one completed woven work. Five people say they have finished two pieces. Nine respondents claim three finished pieces each. Thirteen enthusiasts have completed more than three woven fabrics, demonstrating a serious interest in warp weighted looms, especially notable considering how much slower weaving on this loom type is compared with other hand looms.

It should be noted that all of the respondents weave as a hobby, as research for re-enactment events, as an educational exercise, or for similar motivations, not as a paid full-time profession. The time each person allots for weaving needs to be fitted into the moments when other commitments are not more pressing. Weaving

with a warp weighted loom takes a great deal more time than the more familiar floor loom used by modern hand weavers.[369]

Of the fourteen people reporting between five and ten years of experience, four respondents (2, 14, 21, and 26) demonstrate enough enthusiasm to finish more than three pieces each. Respondent 14 states that she has finished rugs, curtains, an historically accurate over-garment for Roman era Jerusalem, and covers for large pillows over the course of six years while demonstrating the use of the loom at a month long, annual living history event in Texas.

In the five to ten year time frame, two individuals have completed three textiles each (respondents 25 and 39), while two others have finished two fabrics apiece (respondents 4 and 36). Three people (respondents 16, 22, and 30) have finished one woven piece per person, with respondent 22 admitting she finished a single piece in one week seven years previously. The two remaining people fitting into this category (respondents 7 and 14) report the first piece still on the loom, unfinished.

Respondent 6 was unable to accurately identify the number of woven pieces he has completed. His motivation for learning to weave on a warp weighted loom is specifically linked to his business creating items for the re-enactment and museum communities. He wanted to understand how the loom functions to increase his comprehension of the archaeological artefacts related to the loom. He accepts orders to replicate tools based on these artefacts, and desired to create more accurate working reproductions for his clients. Instead of having his own loom, respondent 6 took advantage of those owned by others to learn the weaving techniques. For the most part, he worked with small samples for experimentation or teaching set up by others.

[369] Fransen, Nørgaard and Østergård, *Medieval Garments Reconstructed*, p. 26.

The fifteen people who have used the loom less than five years have an even wider numerical range of finished pieces. Respondent 15 enjoyed working with the loom enough to have finished more than four pieces. Three individuals (respondents 31, 33 and 34) have finished three pieces each. Two people (respondents 17 and 36) have finished two fabrics. Four (respondents 3, 35, 42 and 43) have finished a single piece of work in less than five years. Respondent 43 has been weaving or less than a month, finishing a single piece of fabric, but states that she has found the process very engaging. Respondent 3 finished weaving one piece, but states that she had not ever set up a warp weighted loom.

Five of the people with the least amount of time working with the warp weighted loom have not yet finished the first piece on the loom at the time they answered the questionnaire (respondents 10, 18, 23, 32 and 37), suggesting they are the beginners sought for their fresh insight, had there been time to pursue further research questions.

Reasons for taking up warp weighted weaving in the first place prove interesting and varied. Only four people of the forty four respondents indicate it is for professional interest, while twenty three are driven by personal curiosity. The most popular reason for taking up this loom type is living history research, with twenty eight people giving that answer. Eight people set up looms for the museum and film industries. Four report other unspecified reasons. Respondent 6 wants to better serve his customers, as mentioned earlier. Respondent 17 set up his loom for educational purposes, with the thought that learning to weave on this loom type would provide insight into the lives of people from Iron Age Levant, his area of academic study.

With twenty eight respondents driven by the focus of living history as a way to understand the past, and another eight working with museums and documentary

makers, the desire of this group of people to connect with and understand the past seems to be a particularly strong motivator. This group makes up thirty six of the forty four respondents, or nearly eight two percent of the total, suggesting a high level of interest in historical accuracy in their work.

Interestingly, two of the four individuals who started weaving on a warp weighted loom for reasons not specified in the questionnaire are men. In all, four men returned completed questionnaires (respondents 6, 13, 17 and 40) making up only eleven per cent of the total. This is an interesting statistic considering the perceived change in gender roles between Anglo-Saxon England, where women are believed to be a majority of the weavers, and current society where the craft is theoretically perceived as less gender specific.[370] It does suggest that textile work may have more appeal for women than men.

Three of the four individuals who reported professional curiosity as a motivator for learning to use this loom type also worked in the re-enactment communities; respondents 6, 37 and 44, who were a male, and two females, respectively. The other woman, respondent 12, did not report involvement in re-enactment, but she states she is interested for personal as well as professional reasons.

Eight people (respondents 1, 13, 19, 27, 28, 30, 35 and 37) report setting up the loom for museums and the film industry, making up nearly twenty per cent of the respondents. Of those, two (respondents 1 and 27) report such commissions as the primary reason for working with the warp weighted loom. Respondent 1 indicated her weaving career with the warp weighted loom started with a replica held at the Archaeological Resource Centre in York, United Kingdom, and afterward she started working with re-enactment communities. It is encouraging to note that the film and

[370] Henry, 'Who Produced the Textiles?', p. 52.

museum industries express an interest in the importance of textile work to the early medieval world, choosing this weaving technology specifically to comment on it.

Because people cannot express curiosity or learn about something they do not know exists, a question was included to discover when, how or where the individual first discovered the warp weighted loom. Such information might indicate the level of research the respondents are willing to undergo. It might also suggest what aspect of the history or mechanics of the loom was a draw for each person. The question was intended to also hint at the basic assumptions the respondents may have made about loom function due to the method of introduction.

Respondent 5 states her interest began when she saw someone using a warp weighted loom and wanted to know more. This seems a likely beginning for anyone, whether the loom was seen in a book, video, online, or in person. Respondent 43 first read about the loom in Elizabeth Barber's *Prehistoric Textiles*, and wanted to try it, suggesting that for her, basic understanding of loom set up and use was through the lens of that particular book. For respondent 31, the addition of warp weighted weaving to her store of knowledge was 'just for the love of weaving in general', an attitude which was shared by respondent 36, who reports enthusiasm for the tool as a 'fibre person'.

Intriguingly, ten of the forty four, or nearly one fourth of respondents, reported having no weaving experience before learning to use the warp weighted loom, indicating that while they did not have any preconceived ideas on how to work with one, they also had no weaving skill set to rely on. A lack of preconceived expectations allows the weaver to come up with new and interesting possibilities for using the loom instead of relying on the current understanding, providing a fresh view which may be beneficial to the research. However, an experienced weaver will have a working knowledge of how string behaves during weaving which will

provide a context for problem solving, and determine which solutions are probable over all the solutions that are possible.

Whether the individual already knew how to weave or not, living history groups often sparked an interest in warp weighted weaving. It should be noted that individuals involved in the living history movement tend to be committed and experienced researchers. They have invested a great deal of personal time to understand the history of their craft, and strive for accuracy to the best of their ability.

Work in or with The Society for Creative Anachronism gave respondents 30 and 34 the motivation to learn about this loom, with respondent 34 also active in a Norse living history society. A historically accurate display for tenth century Viking culture encouraged involvement with warp weighted looms for respondent 36. Respondent 39 also states her interest stems from her activity with re-enactment. First century Roman living history research is the reason respondent 35 started to weave on the ancient tool. Respondent 9 reports she is motivated by her re-enactment group and the fortunate timing of a large storm in the Manchester, UK, area. High winds conveniently felled appropriately sized trees and branches at a time when she had both the time and the interest, allowing her to take advantage of the literal windfall.

Respondent 18 has used a floor loom, but her re-enactment group informed her about a loom type more appropriate for their preferred era that would also be easier to transport to events. Ease of transportation as well as historical accuracy were the motivating factors that encouraged respondent 5 to start weaving on the warp weighted loom. When health concerns kept her from continuing her work, her husband, respondent 40, took up the responsibility. He discovered that he enjoyed

working on the looms he had been crafting and continued to weave because of his involvement in the re-enactment and educational communities.

Indulging the impulse to teach, common among those involved with living history, respondent 23 wanted to take her experience as a re-enactor to a modern annual fibre festival, bringing a warp weighted loom to show people something not likely seen by attendees before. Respondent 41 has also taken her loom to the Taos, New Mexico, International Festival to demonstrate medieval weaving technologies.

A few people remember very specific events instigating their experience with the loom. Respondent 19 was given the opportunity to indulge in her curiosity about the loom with the 150th anniversary of the Surrey Archaeological Society. The society requested that she demonstrate Iron Age weaving to celebrate and educate their members. A friend of respondent 28 worked at Castell Henllys in Pembrokeshire. This friend then asked the respondent to set up a warp weighted loom for display at the castle. Canadian respondent 29 started weaving on the loom as a demonstration for the Norstead Viking Village located near the archaeological site L'Anse aux Meadows in Newfoundland. The people who built Viking Hjem, a small, historically accurate reproduction of a Viking era home found in Elk Horn, Iowa, asked respondent 37 to set up and use the loom owned by the local living history group, Skalborg. Respondent 14, one of the most active weavers with a high number of completed pieces, has been weaving at a Christmas village in Texas for fifteen years and really wanted the warp weighted loom as an appropriate loom type for New Testament era Israel as soon as she learned about it.

Some of the reasons stated by individuals demonstrate factors other than education, museum work, or for re-enactment purposes when choosing to learn this archaic form of weaving tool. Respondent 6, as mentioned earlier, makes his living out of creating tools and costumes for the re-enactment communities. He is one of

two individuals to actually earn a notable portion of their income from activities directly related to the warp weighted loom. The other, respondent 40, addresses school aged children with his wife, demonstrating the use of the loom with other Anglo-Saxon or Viking era tools, costumes, and objects, as their primary commercial enterprise. As might be obvious by the use of the masculine pronoun, both of these individuals are men. While they both get paid to work with the loom, at least as part of a larger enterprise, respondent 6 does not consider himself much more than a dabbler with this particular technology. Respondent 40 is the only individual who answered the questionnaire that is both paid, and has enough experience to be called an expert. Expertise, at least in this field of endeavour, is something that is not currently a money making proposition. A lack of compensation does not reduce the level of experience or professionalism exhibited by some of the weavers in this survey.

Archaeological professionalism motivated respondents 11 and 17. Respondent 17 researched the textile trade in Iron Age Levant, situated geographically in the extreme eastern edge of known archaeology for warp weighted weaving tools.[371] He reports that it became an essential part of his research in the textile production of the time and place for his dissertation. Respondent 11 states that she is an archaeologist working in anthropology with an interest in prehistoric textiles. Both believed understanding the process of warp weighted weaving necessary for a more comprehensive understanding to aid in their archaeological work.

For some, it was the specific abilities of the loom type when compared with other primitive looms that drew them to the warp weighted loom. Cloth created on two beamed looms is limited to a length of warp double the distance between the

[371] Nielsen, *Kirkes Væv*, p. 39.

beams.[372] Back strap looms, due to the method used to keep tension, are also limited in the width of the cloth as well as the length.[373] A warp weighted loom is designed so that any length of warp can be woven on the loom. One simply chains or wraps the warp that is longer than where the weights are hung, and slides the weights further down the warp as the woven cloth is wrapped around the cloth beam. This was demonstrated by the weaver filmed by Grøstol and is hinted at in the image from the pattern book that is shown in figure 13.[374]

Respondent 33 wanted a primitive loom with the ability to accommodate a longer warp than a back strap loom could produce. Respondent 22 wanted a loom able to weave wider fabrics. Respondent 2 wanted a loom that was both wider and could accommodate a longer warp. These three weavers desired the same qualities that allowed the warp weighted loom longevity as the primary tool for creating large pieces of fabric for a sizable portion of recorded history. It is possible that these individuals may be able to differentiate the associated tools and wear patterns of the various primitive looms because of their experience with different types, if any differences are to be found.

An interest in history, specifically Scandinavian history, motivates nearly one quarter of people who answered the questionnaire. Respondent 7 expresses an interest in Norse history, as does respondent 16, who also wants to connect with her Norwegian ancestry. Respondent 43 traces her family roots to Western Norway as well, commenting that she feels a wonderful sense of connection with her ancestry when she weaves with a warp weighted loom. A more generalized fascination with early Scandinavian history motivates respondent 39. Respondent 38 researches

[372] Andersson, 'Tools for Textile Production', p. 29.

[373] Agnes Geijer, *A History of Textile Art* (London: Pasold Research Fund in Association with Sotheby Parke, Bernet, 1979), p. 21.

[374] *Norwegian Folk Museum*, 'Grenevev del 2 av 3'.

Scandinavian textiles and wants historically appropriate equipment, while respondent 42 focuses on Viking age weaving methods. Respondent 36 is looking for a historically accurate weaving tool used by tenth century Vikings to create her own cloth. Respondent 21 wants to learn the weaving techniques of Iron Age Finland and the Baltic and Scandinavian areas, so that she can reconstruct authentic Finnish clothing of the time. Recreating period clothing is also the intent of respondent 22, though her culture of interest was not specified. Whether personal or cultural history, weaving on a warp weighted loom helps these people feel a connection with the past, a trait held in common with many historians.

Historical interest is not the only compelling reason to research this specific loom type. Technological aspects of the loom intrigue some people. Respondent 8 reports a fascination with the technology and concepts involved. An easily constructed, inexpensive frame and tensioning device for her tablet weaving is the driving force behind the research of respondent 15. The inexpensive materials required for the warp weighted loom, especially when compared to other loom types, attracts respondent 39. Respondent 32 was curious to see how the finished product from the warp weighted loom differs from textiles created with the floor loom. Respondent 20 simply wanted to know how the technology works. The warp weighted loom has an attraction for the mechanically minded who want to understand the functional abilities of technology available to earlier cultures.

Other people are interested in the intersection between the several weaving techniques required by the warp weighted loom. Because tablet weaving uses different tools than warp weighted weaving, and is a technique often used to space warp threads for the warp weighted loom, respondent 22 wants to experiment with the tablet woven starting border. Respondent 25 has experience as a tablet weaver and wants to do something different than the usual bands and ribbons, and expand

her knowledge of tablet weaving. The warp weighted loom might be unique among weaving tools because it often uses two different tools to create a shed, tablets and heddles, and two different techniques when creating a finished piece of cloth.

The reasons for learning to use a warp weighted loom are likely more complicated and varied than can be explored in a simple questionnaire, though some basic understanding regarding the thoughts behind the choices can be gathered. To further understanding of these weavers, and their possible usefulness for future experimental archaeology questions, where and how they learned to use these ancient tools also needs to be examined.

This part of the questionnaire also highlights one of the problems with using modern warp weighted weavers to determine ancient practices: the method and approach by which the craft is learned affects the thinking of the weaver. Working through a text to understand a process demonstrates whether that process is possible, but not if it is the most efficient or productive. If no other methods of performing that process are sought, learned or considered, the applicability of the method is not questioned. Learning with a teacher is a more organic and conversational way to learn a technique, allowing for the ideas of two or more individuals to become part of the process, but it can also limit the thought processes to what is taught, if not approached with consideration and creativity. Neither technique replaces the experience garnered over generations of women learning to use and adapt the same tool, but it is still generally more beneficial to ask a person with practical experience about the workings of a craft than someone without that same experience.

Intriguingly, for a tool with an almost completely lost craft tradition in the mid twentieth century, one in four of the respondents reports having a teacher.[375]

[375] Marta Hoffmann was only able to locate six Norwegian women, five of which were elderly, with the knowledge to use warp weighted looms. These ladies were interviewed and observed in the 1950s, but had not used the tools for twenty years or more. By 2010, the craft had been revived enough to allow for a scattering of teachers in and from many countries.

Some respondents then became teachers themselves, with respondent 42 invited to teach at an international wool festival in Taos, New Mexico. Respondent 44 has instructed hundreds of people, by her own report, keeping the labelled unfinished work at her home to remind her of the things she learned while teaching to pass along new techniques and information to the next group of budding weavers.

While eleven respondents had teachers, seven of those also consulted books to further their understanding of warp weighted weaving. Twenty one other respondents also consulted books, for a total of twenty eight individuals relying on the printed word to extend the research and understanding. Three books are specifically mentioned by those who answered the questionnaire, and comprise a sizable amount of the available information on the topic: Marta Hoffmann's *The Warp-Weighted Loom, Cloth and Clothing in Early Anglo-Saxon England AD 450-700* by Penelope Walton Rogers, and *Kirkes Væv: Opstadvævens Historie og Nutidge Brug* by Karen-Hanne Stærmose Nielsen. A book by Egon H. Hansen, *Opstadvæv før og nu*, is also mentioned as a work consulted. Being aware of the contents of these specific texts will help future researchers to understand the basic concepts about the warp weighted loom held by this pool of weavers.

Internet searches are a popular method of research, with twenty respondents using that method. Six individuals use the internet as their only source for information, ten others to add to information acquired from books, and the other four people in this category to augment what they learned from both books and a teacher. The video content now available documenting weavers using the loom is a particularly helpful tool, as it shows the actions of the craft being performed in time through a medium that can be referred to repeatedly at the convenience of student, teacher or researcher.

Continuing experimentation is important for thirty six respondents, as other methods of research, while valuable, did not answer all the questions they had. Weaving, like most other forms of craft, is an ongoing learning process that can take a lifetime to master. With so little information available for the warp weighted loom when compared with other forms of looms, recreating fabrics from the archaeological record would, of necessity, require more experimentation, especially when the limited available information is considered.

Because instructions, whether written, verbal or in diagram form, are in many ways only 'sign posts' for three dimensional observation of movement over time, having a set of weaving skills assists in understanding such teaching aids.[376] To determine the skill set the respondents brought to solve such difficulties and use as a basis for further experimentation, they were asked about personal weaving experience. Thirty four of the forty four respondents report having weaving experience before learning to use the warp weighted loom. However, it must be acknowledged that experience with the more complicated modern looms might create certain lines of thought that may or may not transfer well to working with primitive loom types, such as the warp weighted loom. Therefore, the questionnaire asked about experience with other loom types; back strap, two beamed, Navajo rug, tablet weaving, and a peg or ground loom, which may have more applicable solutions to difficulties arising from weaving on a warp weighted loom. Any experience working with the dynamics of string on a loom is useful, but perhaps the requirements of using other primitive or simple loom types are more beneficial when solving problems related specifically to the warp weighted loom.

[376] Ingold, *Perception of the Environment*, pp. 357-358. Ingold and some of his associates at the University of Manchester experimented with learning unfamiliar knots using only diagrams or verbal instructions. They discovered that both worked well as sign posts, reminding them whether they were appropriately tying the knots. The diagrams were useful after having already learned how to tie the knots, not as instructions. 'We seemed, almost literally, to be caught in a double bind, from which the only escape was patient trial and error.'

Only three respondents, 6, 15 and 17, have not had some experience with other types of primitive looms. Two of these are the men who picked up weaving on the warp weighted loom for professional reasons, specifically understanding the tools he creates in the case of number 6, and to have better comprehension of his research of Levant for number 17. Respondent 15 also reports knowing how to use a tablet weaving loom, so it is possible she picked up this type of weaving after learning to weave on a warp weighted loom, though this is not specified. This may also be the case for the seven individuals who had not learned to weave before taking up the warp weighted loom, but who have also reported experience with other forms of primitive loom.

The most common type of primitive loom in use by the respondents is the tablet weaving loom, which can be used either horizontally or vertically.[377] Choosing to use this loom is reasonable for the respondents considering that this type of weaving is known to be used to space the warp for the warp weighted loom. It is also an inexpensive option that can use, but does not require, a frame as the shed is created by a series of tablets and tension may be created by attaching the warp threads to convenient posts or doorknobs. Thirty seven respondents report experience tablet weaving.

The second most common loom type is the horizontal back strap loom, a primitive loom with a vibrant living tradition currently in use throughout many parts of the world. Twenty three respondents report having used this loom type, with twenty one respondents also having used peg looms, another type of horizontal loom. Factors for choosing these looms are likely to include the inexpensive materials, the amount of available informational materials online and in books demonstrating their use, and ease of locating instructors. The Navajo loom, a vertical

[377] The direction of the loom makes a great deal of difference in the movements and muscles used to create the same fabric, as does the top-down or bottom-up method of weaving.

loom type, which has a vibrant living tradition in the American Southwest, has been used by nineteen of the respondents.

Interestingly, the primitive loom most closely related to the warp weighted loom has only nine individuals who report working with one. The two beamed loom is an upright loom that was possibly in use about the same time as the warp weighted loom, and also has been almost lost to living tradition. It is limited in the lengths and widths of cloth that can be woven on it to roughly twice the distance between the beams. Respondents 2, 22 and 33 started weaving with warp weighted looms to take advantage of the flexibility of the loom relating to cloth widths and lengths over the natural restrictions of the two beamed loom. Perhaps that reasoning also informed the choice of other weavers.

Knowing how to weave or use primitive looms may bring the best skill set to understanding a warp weighted loom, but other forms of fibre crafts would provide insight into the nuances of working with thread. Experience working with the elastic qualities of wool and the less elastic linen and silk could also assist in problem solving. Each type of fibre craft instills a version of 'pottery sense' involving string that can be useful for a weaver.[378] Establishing such experience on the part of the individual respondents was intended to determine the usefulness of specific persons as part of a pool of experts to assist with answering questions that were expected to arise during research.

The questionnaire asked about experience regarding four major types of string craft options: spinning (creating yarns and threads), embroidery, sewing and knitting. Thirty six of the respondents also added a list of other textile crafts they practiced. Of the provided options, the most popular answer is sewing, with forty

[378] See page 105 or Bender Jørgensen, 'Textiles of Seafaring', pp. 65-69, for a description of 'pottery sense' which is also discussed elsewhere in this thesis.

people having that skill. This indicates a level of knowledge regarding the dynamics of cloth.

Thirty four individuals state they have the ability to spin their own yarn. This is encouraging, as it means that the weavers would be able to work with more historically accurate yarns, as well as having an intrinsic understanding the nuances of yarn and its creation. Spinners are also able to understand the nuances that differing fibres, amount of twist, and type of yarns are likely to have on tools. They also have an intimate knowledge of how minute changes in thread creation are likely to affect the outcome of a finished piece of textile.

Embroidery is a skill thirty three of the respondents have experience with. Twenty five also knit. Both increase understanding of tension issues when working with thread, as well as dealing with snags, knots and other problems that occur when yarns pass by and through each other.

Other fibre craft skills volunteered by the respondents include sprang and naalbinding, both early medieval crafts, as well as bead work, dyeing, felting, crochet, macramé, basket weaving, papermaking, tatting, bobbin lace and lucet braiding. Only respondent 40 claimed a single fibre craft aside from the warp weighted loom, spinning, that he has experience with. All of the other respondents are practiced with multiple crafting skills with which to solve problems relating to string.

Once their crafting credentials have been established for comparison purposes, the questions became focused on experience and decisions relating specifically to the warp weighted loom. As weft beaters are the most varied of tools in availability of types and usage, they will be discussed first.

Thirty six people use weaving swords, which is not surprising considering the established relationship of the beater with the loom in the literature, although

respondent 14 states that the weaving sword did not function well for her. Of the other eight individuals, two use small belt shuttles as beaters. Two use combs exclusively. Two others only use tapestry beaters, which are specifically designed, heavily weighted, combs to pack weft thread in very tightly to completely cover the warp thread, which is desirable for tapestry weaving. Respondent 28 says her choice of weft beater depends on the project undertaken. Respondent 43 uses her hands, as do several of the weavers documented by Hoffmann and the woman filmed by Grostøl.

Four respondents, not including those mentioned previously, use tapestry beaters as well as sword beaters for their work. Eight others also use combs in combination with weaving swords, though respondent 6 uses a comb in combination with a 'pin beater', choosing not to use a weaving sword at all. Only respondent 19 also uses the 'pin beater' and comb combination, though she uses a sword beater as well. In all, eleven people use combs, even though their use is not specifically connected with the warp weighted loom in the literature on the subject.

The same number of individuals use 'pin beaters', though their experience with them varies. Of the eleven people, only respondent 7 says a 'pin beater' helps her beat the weft in solidly. Spacing and separating the warp is what respondent 9 uses the tool for, not beating in the weft. Respondent 29 uses a 'pin beater' for clearing the shed when warp threads tend to stick together, as does respondent 3. Respondents 11 and 40 use them for making fine adjustments to the warp when and if necessary. Respondent 17 uses the sword beater first then the 'pin beater' if needed to distribute the weft evenly. Intriguingly, respondent 19 uses a comb at home but the small bone tool in public, though sometimes she uses a comb to do the same task. When talking to the public, she reminds them that the use of the comb and

‘pin beater’ with the warp weighted loom during the early medieval era are uncertain at this time.

As there is sufficient evidence to suggest there is no such thing as a ‘pin beater’, the use of the tool at all demonstrates the level to which people will strive to make current understanding of the literature work. It is enlightening to note that only one individual actually uses a ‘pin beater’ for beating in the weft, and even then as a secondary help for the more efficient weaving sword, suggesting further evidence that the tool is not useful as a weaving implement, though warp weighted weavers have tried to make it work.

Uniquely, respondent 36 had a boomerang-looking weft beater made, modeled after Hansen’s (see figure 42). She reports that it does not work well at all, putting forth the suggestion that the light woods used to create the tool made it unsuitable for a weft beater.

Warp weights are the most definitive part of the loom known from archaeological evidence, being much more common than any type of possible weft beater. Though the use of warp weights is much more obvious than weft beaters, especially the ‘pin beater’, the size, shape and mass of warp weights has wide historic and geographical variation. Interested in the experience of the weavers with loom weights, one of the questions regards the decisions made when choosing the tensioning device. The intent was to determine whether the choice of loom weight had any noticeable effect to the finished fabric or the experience of weaving. Time and a lack of any literature with data concerning larger geographical areas of weights did not allow for follow up on the question.

Twenty two people specifically chose to work with the familiar doughnut shaped weights used by weavers in Anglo-Saxon England. Eleven chose the flattened triangular shape preferred by the Classical Greece era weavers. Only

respondents 1 and 8 tried the bun shaped weights that were also used in Anglo-Saxon England. Seventeen respondents chose none of the three given options, either choosing to use a different shaped clay weight or some other form of tensioning device such as pebbles in sacks, rocks or some other 'found item' type of weight.

Firing the clay makes a warp weight much more durable over time, so twenty three people did so. Only eleven used unfired, or 'green', clay for their weights. Eight of those eleven also used fired weights, likely because of the experience with comparative fragility of green weights, which tend to fragment and disintegrate with use, though this is an assumption, and not backed by the data that would have been a follow up question.

A majority of respondents use, or started with, loom weights made up of improvised materials. Thirty people tried other items than traditional clay loom weights to tension their looms. Popular items include rocks, or pebbles and sand in bags. Respondent 8 specifically mentions Ozark river rocks with natural holes in them, which must have taken quite a bit of time in order to locate enough for tensioning a whole loom. She had also used plastic soda bottles with water to adjust the weight, as did respondent 7. Respondent 14 used one pound rocks, but has also used metal washers with rubberized paint. Other creative options are the spice jars used by respondent 22; ball bearings from an automobile used by respondent 26, who also used mugs from her kitchen; and marbles in zipped plastic bags used by respondent 33. The most interesting 'found item' used for weights is reported by respondent 3, who gathered together old ceramic power line insulators for her loom. Though somewhat exotic in some cases, the choice of something other than clay weights speaks to the 'found item' aspect of some of the earliest and latest documented examples of warp weighted looms. It would be an interesting follow up question.

Once the initial experiment was conducted, most weavers continued to research and acquired warp weights more appropriate for the time frame they were attempting to emulate. Historical accuracy within the limitations of the abilities and funding of the weaver was highly sought out by a majority of the participants of the questionnaire. All forty four respondents have researched using the available literature on the subject. Thirty have also sought out looms on display in museums for examination. Thirty five have observed warp weighted looms in use at living history events, indicating the interconnectivity of this group of weavers. The internet was used for continuing research for forty of the respondents. Not a single respondent relied on only one form of research to understand and create a loom.

Several of the questions were designed to investigate the prevalence of the idea of historical accuracy and to what extent the weavers involved would participate in research, in order to underscore the expertise of this group of people due to past skepticism found in some areas of academia. Some level of interest in history can be assumed, otherwise a different, more easily accessible form of loom and weaving would have been chosen. Remember, these weavers had to either construct the loom themselves or find carpenters, potters and possibly bone carvers to create the loom and the attendant tools. Fewer than one quarter of respondents state that their looms were designed for functionality alone. The point of such questions was to gauge the commitment to historical authenticity of the pool of experts over those interested in the basic functionality of the loom. Both groups would be useful for further research, but the difference in approach would affect their understanding of the loom, so must be documented.

The basic set up of the frame of the loom, as currently understood, was investigated. Thirty four of the forty four participants designed their looms to lean against a wall, taking advantage of the natural shed available to the warp weighted

loom. Respondent 41 also designed hers to be pegged into a wall, which is one of the possible ways thought to secure the loom in a building. Fifteen also recognized the difficulties inherent in the basic design of the loom when moving it around to demonstrate warp weighted weaving to the public. As most of the venues that living history participants work in do not have convenient wall space for weavers, as was noted by respondent 3, these people also designed a loom with the ability to be able to stand alone when necessary, a solution that may explain the lines of loom weights occasionally found in the center of Anglo-Saxon or Viking era structures.

For twenty nine individuals, the ability to move the loom is important. This is also likely due to the high number respondents who are teachers, both in the area of historical re-enactment, and as weaving instructors. Thirty two of the respondents, nearly three quarters of them, demonstrate warp weighted loom weaving for the public. Few if any venues will not have a loom available to use for weaving, though some museums might have looms on static display. Conveniently, historic reproductions of the warp weighted loom are able to be constructed so as to be easily disassembled for moving and storage.

Thirty five of the respondents built looms out of wood instead of more modern materials such as plastic tubing. Twenty two people went to the trouble to research the types of tree used from the surviving artefacts, indicating a desire to be as accurate as possible to the scant archaeological evidence. Twenty six individuals chose to use easily available local materials, such as pine or other less expensive woods, which follows the approach of early medieval weavers. Respondent 9 was particularly ingenious in this aspect, waiting for a convenient storm in her area to blow over the trees she used to make her loom.

Though the actual size of warp weighted looms may never be known due to lack of physical evidence, twenty two people researched the estimated size of the

looms and attempted to create their looms based on the limited information available. Eleven individuals chose to base the height and width of their looms on the measurements of the weaver. Four people constructed their loom according to research and the measurements of the weaver, indicating either multiple looms. It is also possible that in their attempts to research they came across the idea that each loom was designed for the weaver it was built for, only changing sizes when the loom was beyond repair. Respondent 3 designed her loom for the width of the cloth she wanted to achieve, which is also another consideration that may have been taken into account by previous generations of warp weighted loom weavers.

Twenty one respondents chose the size of their loom based on the size of the room in which it was going to be used. This is also a possible consideration for Anglo-Saxon carpenters when building the looms used during that time frame, though this seems less likely. Some of the weavers designed their looms to cope with physical limitations, such as not being able to stand for extended periods, as required by a full sized warp weighted loom. Respondent 43 has a loom designed to be short enough to allow her to sit while working.

Another factor in choosing a size for a warp weighted loom is the number of individuals expected to work on it at the same time. A larger width of cloth beam is needed to give the weavers work space without becoming a hindrance to each other. The weavers in Hoffmann's ethnography worked in pairs, and there are artworks from Classical Greece that show two women working together. However, only eighteen of the respondents have experience working with another weaver. Forty report working by themselves while weaving. Only respondents 18, 24 and 36 have always woven with a partner. Whether these statistics are based on personal choice or simply the rarity of individuals working with the warp weighted loom requires more in depth investigation at a future time.

How heddle loops were attached to heddle bars was asked, because it is one of the least known or investigated aspects of weaving on a warp weighted loom. No art or archaeology exists to assist in understanding heddle loops, though logic dictates they must have been a part of the loom. Otherwise, heddle bars would not be depicted in the artwork, as they would not be useful or needed. Fourteen individuals used 'knitted on' loops, as discussed in Hoffmann.[379] However, this term is never satisfactorily explained, and the diagrams were found not to be very helpful by the weavers just over half the time. Respondent 35 went so far as to say she needed a glass of wine to help her relax enough to decipher the diagrams. The husband and wife couple explained that heddle loops done according to available diagrams tend to slip, altering the distance each warp thread is lifted, creating a messy shed. Respondent 43 writes that she does not know what 'knitted on' means, but would love to learn. Obviously there is some confusion about the terminology, though it may stem from the translation of Hoffmann's work from Norwegian to English, which was then parroted by other publications.

Eighteen respondents use knotted on heddle loops to cope with the difficulties in understanding and working with knitted heddle loops. Three individuals, respondents 7, 41 and 44, have used both knitted and knotted heddle loops, presumably attempting knitted on loops described in the literature before moving to the more secure knotted heddle loops.

Another more current type of heddle loop is used with floor looms, which involves a single, short loop of string for each individual warp thread. It is currently accepted that a continuous length of string tied around the heddle bar and looping around each warp thread then back around the heddle bar, repeated across the entire width of the warp is the preferred method for setting up warp weighted looms as the string easily be wound into a ball and reused. When the amount of time it takes to

[379] Hoffmann, *Warp-Weighted Loom*, p. 45.

spin the required yarn for heddles by hand is taken into account, it seems highly unlikely the weaver would choose a form for heddle creation that would destroy the yarn or make it unusable for other purposes, if desired. Fourteen respondents chose to work within their available knowledge base, however, using short knotted loops for their heddles in the manner of the floor loom.

Five chose other options, such as weaving tablets, as heddles.

It should be noted that the film made by Anna Grostøl, which clearly shows the weaver using knitted heddles in a manner not clear through diagrams, was not available on YouTube until after the questionnaire was closed.[380] The value of this film for understanding one method of preparing the warp weighted loom for weaving cannot be understated.

This single question demonstrates the value of gathering a group of people experienced with working on the loom to explore questions relating to use and the viability of certain ideas. While the exact details of the usage of heddle loops for early medieval weavers will never be known, some aspects of how they function can shed some light on the question. Hands-on research by experts can also eliminate the unlikely or untenable thought experiments that have crept into the literature over time.

Several of the questions asked were designed to organize further research into nuances of tool use and the effects of modern machine made yarns compared with handspun yarn to determine what, if any, differences were perceived or observed. Such questions also allow the researcher to focus on the individuals with the experience most able to answer the research question. Other details pertaining to historical accuracy relating to warp spacing, the differences in working with linen

[380] *Norwegian Folk Museum*, 'Grenevev del 2 av 3'.

and wool, and whether dyes affect weaving practices have also been asked for these same reasons.

Experience with varying weave patterns was requested to determine whether deciding to weave a twill or a tabby pattern could alter the loom set up.[381] Follow up questions, a gathering of ideas regarding warping, and experiments for trying different warping options to determine which ideas are practical was planned, but not attempted. These questions have not yet been pursued with any detail due to the previously mentioned time constraints. The information is still useful, as the individuals who answered can be approached for further experimental archaeology research questions.

The search for individuals with experience using warp weighted looms was originally intended to shed further light on the archaeological, linguistic and art evidence available. However, experiments not involving historically accurate materials can also be valuable. Called proof of concept experiments, the process uses readily available materials to prove that an idea is workable or practical. A weaver does not need a reproduction whale bone weaving sword, or ash heddle bars to explore the basic dynamics of working with warp weighted looms. In some ways a proof of concept approach requires more creativity and thought than more traditional methods handed down by teachers or through books, as the weaver is less likely to be locked into a certain line of thought.

As has been noted before, the some of the respondents to the questionnaire have been quite creative in their materials. Bags of marbles, rubberized washers, water bottles and power line insulators make effective warp weights. Respondent 22, who is a medieval textiles researcher, used the back of a chair as a loom to gain a basic understanding of the loom. The most interesting warp weighted loom from this

[381] Respondent 44 rather ambitiously produced some double weave, a pattern that creates two layers of intertwining cloth simultaneously. The most famous double weave from the Viking era is the Oseberg Tapestry, so it is likely the technique was practiced on warp weighted looms.

group of weavers is also the smallest one. Constructed one afternoon out of items found at and in her desk, Reetta Hänninen was able to create a proof of concept loom in a fairly short amount of time, apparently using a finger as the heddle bar.

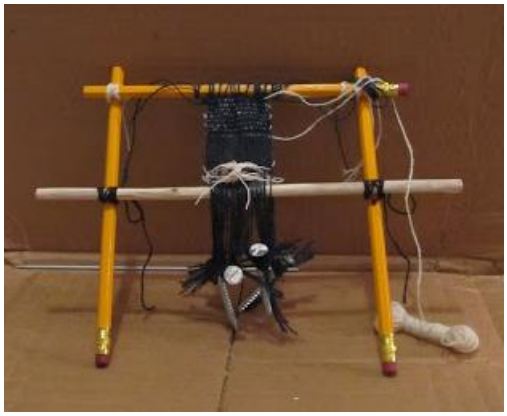

Figure 44. Warp weighted loom constructed out of found materials at her desk. Loom and image by Reetta Hänninen. Image and name used with permission.

Still, a majority of these weavers do strive for historical accuracy when researching and constructing the loom, continually searching for more answers and more efficient and effective ways of working. This attitude has seen some level of acknowledgement from museums who seek out warp weighted loom weavers for live demonstrations for the public. Respondent 24 was approached to create a cloak woven on a warp weighted loom from a single piece of cloth for a Saxon princess exhibit. Her work is on semi-permanent loan at the Kirkleatham Museum in Redcar, UK. As a group, they are uniquely situated to assist greatly with experimental archaeology relating to Anglo-Saxon and Viking textiles due to their experience, creativity, and valuable in-depth research.

Conclusion

A great deal more information has become available through archaeology and art since the publication of Marta Hoffmann's *The Warp-Weighted Loom,* especially in the area of Anglo-Saxon and Viking era Britain. In the fifty years since that publication, archaeology has developed new approaches and uncovered a substantial number of new artefacts. A renewed interest in textile research has also instigated a reexamination of older discoveries. Unfortunately, no large systematic survey of these artefacts has yet to be undertaken. However, enough information is available to comment on the available artefacts.

Previously, it was thought that none of the wood parts of the warp weighted loom survived in Britain. The only confirmed discovery of wooden medieval parts of the frame of the loom and a wooden weaving sword are from Gården under Sandet, a Viking settlement in Greenland dating from 1000 AD. However, closer examination of certain archaeological reports show misidentified loom uprights from Dover and Gloucester dating to the early part of the Anglo-Saxon period, allowing for the possibility of survival of other sections of the loom which have been excavated but not understood for what they are.

With the warp weight being the most obvious remnant of the loom, some time was spent researching the artefacts. An examination of current loom weight classification systems proved to be useful only as very broad definitions, not adding significantly to the understanding of these artefacts. Looking at the dating of the different Anglo-Saxon and Viking era weights and comparing that information with current theories regarding the geographical and historical expansion and decline of weight shapes in England has proven the hypothesis for the weights and indeed this loom type and its assumed replacement, the two beamed loom, inaccurate at best, or at least incomplete.

Though not as common an archaeological find as individual or small groupings of weights, double and single lines of warp weights which indicate working looms are found in such diverse places as Dover, West Stow, and Grimstone End. Examination of the organization of the weights when found in the lines that indicate a complete loom set up make it possible to provide reasons related to weave structure and warp spacing for the discovery of single versus double lines of loom weights and the spacing of those weights. Multiple looms using both single and double lines of weights are often located in the same building, which indicate multiple types of cloth being woven at the same time in the same place. These archaeological discoveries, while published in the literature on the loom, had not previously been noted or discussed in any depth.

Ancillary tools related to, but not necessarily part of, the warp weighted loom are discussed in the thesis. These tools include the practice of using tablets for weaving bands to space the warp threads which is commonly held to be the definitive way to prove the textile was made on a warp weighted loom. While an often used way to achieve the spacing, tablet weaving is not the only method used by Anglo-Saxon and Viking era weavers as can be determined by close examination of the rare available textile border fragments. It is likely the modern focus on tablet weaving for this task stems from the fact that it is the only warp spacing method that requires a tangible tool, and not just the experienced fingers of the weaver.

The small bone hand tools currently known as ‘pin beaters’ have proven not to be a weaver’s tool at all after examination of historiographical, linguistic, artistic, archaeological and wear pattern evidence. Even if such a tool existed as a weaving tool, the correlation between double-ended ‘pin beaters’ and the warp weighted loom has no basis in evidence aside from the decrease of such tools in specifically studied areas of York around the same time as warp weights start disappearing from the

archaeological record. Artistic evidence suggests that slender, single-ended tools may have been associated with the warp weighted loom, though the size of the bone tools from Anglo-Saxon and Viking era digs make the identification of these tools as 'pin beaters' an unlikely possibility for the tool depicted in artistic evidence. It is more likely that a whole range of similarly sized tools with the same vaguely related shape have been categorized as a single type of tool without having undergone any serious examination.

A study of shuttles, the possibility of weaving combs from the appropriate era as weft beaters and sword beaters as related by artwork of the warp weighted loom, archaeological finds and linguistic evidence are each explored in the thesis. Included along with known archaeological and art evidence, the experience of modern warp weighted weavers and the resultant wear patterns on bone tools are used to shed light on the known objects. With the new information available through modern experimental archaeology involving the warp weighted loom, these topics are reexamined for new possibilities and a deeper understanding of the tools.

The advent of the internet has allowed art work to become more accessible to scholars. New images for the warp weighted loom have surfaced in Late Classical/Early Medieval grave markers from Spain and Turkey, adding a few more tidbits of information to what is known about the loom. The new artwork raises questions regarding the tools traditionally accepted to be associated with warp weighted loom, as one particularly memorable stele has depicted both single-ended 'pin beater' shaped items and combs thought to be used only for hair. Especially interesting and needing more study are the reputedly numerous bas reliefs from Anatolia.

Enquiring after the experiences of warp weighted loom weavers of all skill levels from the teacher of hundreds to a beginner who has never woven before

demonstrated the wide variety of creative solutions the human mind brings to the problem of reviving a lost craft. A group of weavers was sought and given a questionnaire to explore their discoveries and experience while weaving with the loom, and to find the questions and connections that academia had yet to consider. The focus of the questionnaire was to establish the experience of the weaver firstly with the warp weighted loom, and then with other weaving and textile crafts, to demonstrate their level of expertise.

Other questions were intended to determine the best subjects to ask more specific details regarding the use of various tools and the practicality of current theories related to the working of the loom. The time constraints for completion of the thesis added to the lack of basic correlation work for archaeological finds did not permit the intended follow up questions to be pursued. Still, there is now a beginning for locating and expanding on this pool of experts, and a basic understanding of their experience and dedication to the craft.

These weavers were also gathered with the intent of exploring archaeological evidence and wear patterns, possibly through the use of experimentation. They were also intended to be used as a sounding board, as one person cannot possibly conceive or eliminate all ideas related to a craft or series of related tools. Though many different avenues were explored to locate and contact warp weighted weavers, those willing to answer the questionnaire came primarily from the ranks of the living history movement.

A rarely touched subject by academics outside of the realm of museum studies, research among and about the area of medieval living history, re-enactment, and historical interpretation is examined, especially as it relates to textile arts. The history of some of the larger groups and societies was briefly explored in the thesis to provide background information and demonstrate the level of research and

historical accuracy these groups offer. Individuals involved in these activities were most likely to be those who did extensive research and had experience using medieval textile technology. The combination of the history, amount of research, and experience already gathered suggests that contacting these groups to locate such people would greatly reduce the time required for accurate experimental archaeology, as they already have the necessary tools and skills for such research.

Appendix 1: Questionnaire Responses: Multiple Choice

Question 1: How long have you been using a warp weighted loom?

a. More than 10 years.
b. Between 5 and 10 years.
c. Less than 5 years.

Respondent	A	B	C
1	x		
2		x	
3			x
4		x	
5	x		
6 (male)		x	
7		x	
8	x		
9	x		
10			x
11	x		
12	x		
13 (male)	x		
14		x	
15			x
16		x	
17 (male)			x
18			x
19		x	
20	x		
21		x	
22		x	
23			x
24	x		
25		x	
26		x	
27		x	
28	x		
29	x		
30		x	
31			x
32			x
33			x
34			x
35			x
36			x
37			x
38	x		
39		x	
40 (male)	x		
41	x		
42			x
43			x
44	x		

Question 2: Why did you start using this loom?

a. Professional curiosity. c. For my re-enactment/living history group.

b. Personal interest. d. A set up for a museum/film. e. Other.

Respondent	A	B	C	D	E
1				x	
2		x	x		
3		x	x		
4			x		
5		x	x		
6					x
7		x	x		
8		x	x		
9			x		
10	no answer				
11					x
12	x	x			
13		x	x	x	x
14			x		
15		x			
16		x			
17	x	x			x
18			x		
19		x		x	
20		x			
21		x			
22			x		
23			x		
24		x	x		
25			x		
26		x	x		
27				x	
28		x		x	
29			x		
30			x	x	
31		x	x		
32		x	x		
33		x	x		
34			x		
35				x	
36			x		
37	x	x	x	x	
38		x	x		
39			x		
40			x		
41	x	x	x		
42			x		
43		x			
44		x	x		

Question 3: Where did you learn to use one?

a. From a teacher. c. From the internet.

b. From a book. d. Experimentation.

Respondent	A	B	C	D
1				x
2			x	x
3	x			
4			x	x
5		x		x
6	x	x	x	x
7			x	x
8		x		x
9		x		
10		x	x	x
11				x
12	x	x		x
13	x			x
14		x	x	x
15			x	
16	x			
17		x	x	x
18		x	x	x
19		x	x	x
20				x
21		x		x
22		x		
23	x	x	x	x
24		x		x
25	x			
26				x
27			x	x
28		x		x
29	x	x		x
30		x	x	x
31	x	x	x	x
32	x			x
33			x	
34	x	x	x	x
35		x	x	x
36		x		x
37		x		x
38		x		x
39	x	x	x	x
40				x
41		x	x	x
42		x	x	x
43		x		x
44		x	x	x

Question 4: Were you a weaver before using a warp weighted loom?

a. Yes.

b. No.

Respondent	A	B
1		x
2	x	
3	x	
4	x	
5	x	
6		x
7	x	
8	x	
9	x	
10	x	
11	x	
12		x
13		x
14	x	
15		x
16	x	
17	x	
18	x	
19	x	
20	x	
21	x	
22		x
23	x	
24	x	
25	x	
26		x
27	x	
28	x	
29	x	
30	x	
31	x	
32	x	
33		x
34	x	
35	x	
36	x	
37	x	
38	x	
39	x	
40		x
41	x	
42	x	
43		x
44	x	

Question 5: Which other primitive looms have you used?

a. Back strap. c. Navajo. e. Peg. g. None of the above.
b. Two beamed. d. Card/Tablet. f. Other.

Respondent	A	B	C	D	E	F	G
1				x			
2	x			x	x		
3				x		x	
4		x		x	x		
5	x			x		x	
6							x
7			x	x			
8					x	x	
9				x	x	x	
10	x					x	
11	x	x	x	x	x	x	
12	x			x			
13	x			x		x	
14	x		x	x	x	x	
15							x
16	x			x			
17							x
18				x			
19	x			x	x	x	
20	x	x	x	x	x	x	
21			x	x	x		
22	x					x	
23	x			x			
24				x		x	
25			x				
26				x			
27	x		x	x	x		
28	x		x	x	x		
29	x	x		x	x	x	
30	x			x			
31	x			x	x	x	
32		x		x	x	x	
33				x			
34				x	x		
35	x			x	x	x	
36	x			x	x		
37	x			x	x		
38	x			x	x		
39				x	x	x	
40		x		x			
41		x	x			x	
42	x	x		x		x	
43	x					x	
44	x	x	x	x	x	x	

Question 6: Do you also…

a. Spin. c. Sew. e. Other fibre craft work.

b. Embroider. d. Knit.

Respondent	A	B	C	D	E
1	x	x			
2		x	x		x
3	x	x	x	x	x
4	x		x	x	x
5	x	x	x	x	x
6		x	x		
7	x	x	x	x	x
8	x	x	x	x	x
9	x	x	x		x
10			x		x
11	x	x	x	x	x
12	x		x		x
13	x	x	x		x
14	x	x	x	x	x
15		x	x		x
16	x	x	x	x	
17	x		x	x	x
18	x		x	x	x
19	x	x	x	x	x
20	x	x	x	x	x
21	x	x	x	x	x
22		x	x		x
23	x		x		x
24	x	x	x		x
25					x
26	x	x	x	x	x
27	x	x	x	x	x
28	x		x		
29		x	x		x
30		x	x		
31	x	x	x	x	x
32	x	x	x		x
33			x	x	x
34	x	x	x		x
35	x	x	x	x	x
36	x	x	x	x	x
37	x	x	x	x	x
38	x	x	x	x	x
39		x		x	
40	x				
41	x	x	x		x
42	x	x	x	x	x
43	x		x	x	x
44	x	x	x	x	x

Question 7: What do you use for a beater?

a. Weaving sword/pick up stick.
b. Tapestry beater.
c. Weaving comb.
d. Pin beater.

Respondent	A	B	C	D
1	x			
2	x	x		
3	x			x
4	x			
5	x			
6			x	x
7	x			x
8	x		x	
9	x			x
10	x			
11	x			x
12	x		x	
13	x			
14			x	
15	x			
16	x			
17	x			
18	x			
19	x		x	x
20	x			x
21	x			
22	Small belt shuttle			
23	x	x		
24	x	x		
25	x		x	
26			x	
27	x			
28	varies			
29	x			
30	x		x	
31	x		x	
32	x			x
33	Small belt shuttle			
34	x		x	
35	x			
36	x			
37	x			
38	x	x		
39		x		
40	x		x	x
41	x		x	
42		x		
43	x			hands
44	x			x

Question 8: What weaving pattern(s) have you tried?

a. Tabby. c. Twill.

b. Tapestry. d. Other.

Respondent	A	B	C	D
1	x			
2	x	x		
3	x			
4	x			
5	x	x	x	
6	x		x	
7	x			
8	x			
9	x			x
10	No answer			
11			x	
12	x	x	x	
13	x		x	
14	x			
15				x
16	x			x
17	x			
18	x			
19	x		x	
20	x		x	
21	x		x	x
22			x	
23			x	
24	x		x	
25	x			
26	x			
27	x			
28	x		x	
29	x		x	
30	x	x	x	
31	x	x	x	x
32			x	
33				x
34	x		x	
35	x			
36	x		x	
37	x			
38	x		x	
39	x		x	
40	x		x	
41	x		x	
42	x		x	
43	x		x	
44	x	x	x	x

Question 9: How many pieces have you finished?

a. The first one is still on the loom.
b. One.
c. Two.
d. Three.
e. More than three.

Respondent	A	B	C	D	E
1					x
2					x
3		x			
4			x		
5					x
6	Uses others'				
7	x				
8				x	
9			x		
10	x				
11					x
12					x
13					x
14					x
15					x
16		x			
17			x		
18	x				
19				x	
20					x
21					x
22		x			
23	x				
24	No answer				
25				x	
26					x
27	x				
28				x	
29		x			
30		x			
31				x	
32	x				
33				x	
34				x	
35		x			
36			x		
37	x				
38				x	
39				x	
40					x
41			x		
42		x			
43		x			
44					

Question 10: What type of yarn/thread have you used?

a. Commercially spun linen/hemp?
b. Commercially spun wool.
c. Hand spun linen/hemp.
d. Hand spun wool.

Respondent	A	B	C	D
1		x		
2	x			x
3		x		
4		x	x	
5		x		x
6	x	x	x	x
7		x		
8		x		x
9		x		x
10		x		x
11				x
12				x
13		x		x
14		x		
15		x		
16	x	x		
17		x		x
18		x		
19	x	x		x
20	x	x		x
21	x	x		x
22		x		
23				x
24		x		x
25		x		
26		x		x
27		x		
28	x		x	
29		x		
30		x	x	x
31	x			x
32		x		
33				x
34		x		x
35	x			
36		x		
37		x		
38		x		x
39		x		x
40		x		x
41				x
42		x		
43		x		x
44		x		

Question 11: Is your warp thread…

a. Singles. c. Synthetic dyes. e. A different colour than the weft thread.
b. Plied. d. Natural dyes. f. The same colour as the weft thread.

Respondent	A	B	C	D	E	F
1	x				x	x
2	x	x	x	x	x	x
3		x	x		x	
4		x	x	x	x	x
5		x	x	x	x	
6	x	x	x	x	x	x
7	No answer					
8	x	x	x	x	x	x
9	x	x			x	
10	x	x		x	x	
11		x				
12	x	x	x	x	x	x
13	x	x		x		
14		x				
15					x	
16		x			x	
17	x	x	x		x	
18		x	x		x	
19	x	x		x	x	
20	x	x	x	x		x
21		x	x	x		x
22		x				
23		x	x		x	
24	x			x	x	x
25			x		x	x
26				x		
27		x	x		x	
28		x	x		x	
29		x	x		x	
30		x	x		x	
31	x	x	x	x	x	x
32		x			x	
33		x				
34		x		x	x	
35		x		x		x
36		x		x		x
37		x			x	x
38	x	x		x		x
39	x	x	x	x	x	
40		x	x	x	x	
41	x		x	x	x	
42		x	x		x	
43		x		x		
44	x	x	x	x	x	x

Question 12: What type of loom weights do you use?

a. Doughnut shaped. c. Flattened triangular. e. Unfired.
b. Bun shaped. d. Fired. f. Improvised materials.

Respondent	A	B	C	D	E	F
1	x	x	x	x	x	x
2						x
3	x					x
4						x
5	x					x
6				x		x
7	x			x	x	x
8	x	x	x	x	x	
9	x			x		x
10	x			x		x
11	x		x	x		x
12	x			x	x	
13						x
14						x
15						x
16						x
17	x				x	
18			x	x		
19	x		x	x		x
20	x		x	x	x	x
21	x			x	x	x
22						x
23						x
24			x	x		
25	x			x	x	
26						x
27	x			x		
28	x			x	x	
29			x	x		x
30	x				x	x
31						x
32				x		x
33						x
34	x			x		
35			x			
36	x					
37	x					
38						x
39						x
40	x		x	x		x
41	x		x	x		
42						x
43				x		
44	x		x	x	x	x

Question 13: How do you space the warp threads?

a. Tablet/card weave.
b. Figure 8 around the threads.
c. Throwing several wefts before beating.
d. A section of tabby.
e. Other.

Respondent	A	B	C	D	E
1	x				
2	x		x	x	
3	x				
4	x		x	x	
5	x				
6					x
7	x				
8					x
9	x				
10	x				
11	x				
12	x				
13	x			x	
14					x
15	x				
16					x
17					x
18	x	x			
19	x				
20	x				x
21	x				
22					x
23	x				
24	x				
25			x		
26	x				
27					x
28	x	x			
29	x				
30	x				
31				x	
32	x				
33					x
34	x				
35	x				
36	x				
37		x	x	x	
38	x	x			
39	x				x
40	x				
41	x	x		x	
42			x		
43	x				
44	x				

Question 14: Is your loom designed to …

a. Lean against a wall. c. Stand alone. e Be historically accurate.

b. Be pegged into a structure. d. Be moved. f. Be functional only.

Respondent	A	B	C	D	E	F
1	x			x		x
2				x		x
3	x			x	x	
4	x			x	x	
5	x		x	x	x	x
6	Uses others'	looms				
7	x		x	x	x	
8	x		x	x		x
9	x			x	x	
10	x		x	x	x	
11			x	x		
12	x					
13					x	
14	x			x		x
15			x	x		x
16			x			
17	x			x		x
18			x	x		x
19	x		x			
20	x			x	x	
21	x			x		
22			x			
23	x		x		x	
24	x		x			x
25	x					
26	x			x	x	
27	x		x	x	x	
28	x				x	
29	x			x	x	
30	x					x
31					x	
32	x			x	x	
33			x	x		x
34	x				x	
35	x			x	x	
36	x					
37	x			x	x	
38	x			x		x
39	x				x	
40	x		x	x	x	
41	x	x		x	x	
42	x			x		
43	x			x		
44	x			x	x	

Question 15: Is your loom made of…

a. Historically accurate woods and carved pegs.
b. Wood and pegs conveniently at hand, like pine.
c. Modern materials.

Respondent	A	B	C
1		x	x
2		x	
3	x		
4	x		
5	x	x	x
6	x	x	x
7	x	x	
8		x	
9	x		
10	x		
11		x	
12	x		
13	x		
14			x
15		x	x
16		x	
17		x	
18		x	
19	x		
20	x	x	
21		x	
22			x
23	x		
24	x		
25	x		
26	x		
27	x		
28		x	
29	x	x	
30		x	
31		x	
32		x	
33			x
34	x	x	
35		x	
36		x	x
37	x		
38			x
39		x	
40	x	x	
41	x		
42		x	
43		x	
44	x	x	

Question 16: Is your loom's size based on…

a. A researched, historical loom.
b. The measurements of the weaver.
c. A convenient size to work with.

Respondent	A	B	C
1	hand-me-down	from mother	
2		x	
3			x
4			x
5			x
6	Doesn't own a	loom	
7	x		
8	x	x	x
9	x		
10	x		
11			x
12	x	x	
13			x
14		x	
15			x
16	No answer		
17	x		
18			x
19	x		
20	x		
21		x	
22			x
23	x		
24	x		
25	x		
26	x		
27		x	
28			x
29		x	x
30	x		
31	x	x	x
32	x		
33			x
34	x		x
35	x		x
36	x		
37	x		x
38			x
39	x		
40		x	x
41	x		
42			x
43		x	x
44	x	x	x

Question 17: Are your heddle loops …

a. Knitted on.
b. Knotted with a single line of thread/yarn.
c. Knotted as single loops.
d. Other.

Respondent	A	B	C	D
1		x		
2			x	x
3		x		
4			x	
5		x		
6				x
7	x	x		
8			x	
9			x	
10		x		
11	x			
12		x		
13			x	
14	x			
15				x
16	x			
17			x	
18	x			
19		x	x	
20			x	x
21		x		
22			x	
23	x			
24		x		
25		x		
26	No answer			
27		x		
28	x		x	
29		x		
30	x			
31			x	
32	x			
33				x
34		x	x	
35	x			
36	x			
37		x	x	
38		x		
39		x		
40	x			
41	x	x	x	
42		x		
43		x		
44	x			

Question 18: When you weave, do you …

a. Weave by yourself.
b. Weave with another weaver.
c. Do so as a demonstration for the public.

Respondent	A	B	C
1	x		x
2	x		
3	x	x	x
4	x		x
5	x		x
6			x
7	x	x	x
8	x	x	x
9	x		x
10	x	x	x
11	x		
12	x	x	x
13	x		x
14	x	x	x
15	x		
16	x	x	x
17	x		
18		x	x
19	x	x	x
20	x		x
21	x		
22	x		
23	x		
24		x	
25	x	x	x
26	x		x
27	x		x
28	x		x
29	x		x
30	x	x	x
31	x		
32	x	x	x
33	x		
34	x	x	x
35	x	x	x
36			x
37	x		x
38	x		x
39	x		x
40	x	x	x
41	x		x
42	x	x	
43	x		
44	x	x	x

Question 19: Where have you seen warp weighted looms?

a. In museums.
b. In books.
c. At living history events.
d. On the internet.

Respondent	A	B	C	D
1	x	x	x	x
2	x	x	x	x
3	x	x	x	x
4	x	x	x	x
5	x	x	x	x
6	x	x	x	x
7	x	x	x	x
8	x	x	x	
9	x	x	x	x
10		x		x
11	x	x	x	x
12	x	x	x	x
13	x	x	x	x
14	x	x		x
15		x		x
16	x	x		
17	x	x	x	x
18		x	x	x
19	x	x	x	x
20		x		x
21	x	x	x	x
22	x	x	x	x
23	x	x	x	x
24	x	x	x	x
25	x	x	x	
26		x	x	x
27		x		x
28	x	x	x	
29	x	x	x	x
30	x	x	x	x
31	x	x	x	x
32	x	x	x	x
33		x		x
34	x	x	x	x
35		x	x	x
36		x	x	x
37	x	x	x	x
38		x	x	x
39		x	x	x
40	x	x	x	x
41		x		x
42		x	x	x
43		x		x
44	x	x	x	x

Appendix 2: Marginalia from Multiple Choice Section

Occasionally, respondents would add small pieces of information in the margins of the multiple choice section. Often the information was added in fragments of sentences or a few words. These statements have been expanded into complete sentences for clarity, though the original phrasing has been kept. In some instances, respondents chose to add several sentences or a paragraph to further explain the answers given. These statements have been set aside in quotation marks.

Respondent 1: I learned to use loom by experimentation from a bunch of people.

I prefer unfired donut shaped weights.

I use $9 bolted joints to make the loom transportable.

My loom is hand-me-down from my mother.

Respondent 3: I have finished one cloth but haven't ever set up a loom.

There aren't many walls at re-enactment shows to prop the loom against.

I was shown the basics of the loom from the person I bought it from.

I have done some weaving on a table loom and a lot of tablet weaving, also some sprang on a frame.

I also know naalbinding.

I have used a blunt re-enactment sword as a beater – one without a cross guard for the pommel.

Some of the improvised materials used for the loom were old ceramic power line insulators

I used wind fallen English woods for the frame.

My loom works standing up with a meter wide fabric, though I am planning to make wider cross beams to make a wider fabric.

Respondent 5: I looked into the Marta Hoffmann book.

I also use inkle, sprang, and tapestry looms.

I know beading.

Respondent 6: ‘Having worked alongside Penny Walton in the archaeology labs at York I developed an interest in early textiles and have ended up running a business using modern spinners and weavers to commercially replicate ancient textiles for museums and theatrical costumers and thought I ought to learn a few basics.’

‘Various folk in my re-enactment group use warp weighted looms so I sort of picked it up by watching and asking a few questions and overlaying this in an in-depth theoretical knowledge of the weave patterns and construction of archaeological cloth.’

I tried spinning both drop spindle and wheel but not good at it, but I do a lot of hand sewing, and embroidery making reproduction costumes for myself and clients.

I tend to use a weaving sword but have handmade bone combs and pin beaters for others.

I have used tabby to teach kids and have tried 2/2 twill.

I never finished anything – I just do small samples for experimentation or teaching.

I have tried weaving with weird and wonderful stuff like nylon, hemp rope and other stuff when teaching kids to weave by identifying the yarns by different textures.

I have used clay toroidal weights (doughnut shaped).

I don’t weave large enough pieces for incorrect spacing to be an issue.

I don’t own my own loom.

Respondent 7: I started weaving on this loom for personal interest, then as part of re-enactment from time to time.

‘I had one friend who had made one so I had seen it in action. Then another friend and I figured out how to do it through experimentation. There is not much in the way of instructions out there (there is more now) so we did a lot of research through various websites/groups to see what folks were doing. In the end it was simply figuring out how to do it.’

I spin, weave, dye, felting - all kinds of things.

‘We found that the weaving sword was great (or a long pick up stick), but the pin beater really helped a lot in terms of beating in solidly.’

My friend has done more with her loom.

I chose doughnut shape from research of cultures.

I first used small water bottles for weights.

I used a tablet woven border, but am familiar with other methods.

‘My loom, made by my husband for Valentine’s Day a few years back, is made to lean against a wall and is based on descriptions of period looms.’

My friend’s loom is an easel type for classes for demos.

My loom is made of pine with hand carved pegs and things, simple and functional.

‘Interesting choice of answers. Some historical looms fit all of the above. Mine was made based on an historical model.’

I use a single line that could be construed as knitted on. (referring to heddle loops)

Respondent 8: I do crochet, braiding, macramé, felting, basket weaving, and papermaking.

I carved own weaving sword/pick up stick.

I have also used an afro pick.

I have finished three demo pieces.

I used commercially spun ‘scum yarn’ of unknown synthetics.

For weights I used Ozark river rocks with natural holes in them, tied in weighed bundles, or sometimes plastic soda bottles with water because they are easily adjustable and portable.

My loom is of convenient size to work with, such as what will fit in a room, or low enough to sit at.

Respondent 9: I learned to use the loom from Hoffmann’s book and her article of weaving in Manda.

I have only woven on small child’s loom and band weaving.

I have also used sprang frame.

I use a pin beater, not for beating as such, but to run along threads to separate and space them.

I did a pile weave with tabby base.

I have set up looms for various organizations.

I have made several looms, one used rocks, several used fired clay weights.

‘None of the answers: I make my looms from natural materials and the size is dictated by the available materials. That said I do try to make them reasonably large as the surviving ethnographic examples I have seen evidence of are pretty big, so maybe I aspire to (a) but am limited to materials.’ (on the size of the loom)

Respondent 10: I have used a primitive stick loom

I also do felting, needle-felting, crochet, kumihimo.

I have not finished a piece yet.

I have used silk, cotton, and bamboo for weaving.

Respondent 13: I have used an inkle loom.

I have also done sprang.

I have used chalk weights as per the archaeology.

Respondent 14: I had a backstrap loom my husband made, but I got frustrated with it.

I also used a small Navajo loom that was made for me.

I found the peg loom really frustrating as the yarn kept popping off.

I have used a box loom or tape loom.

I tat, crochet, and have tried pillow lace.

I tried a weaving sword but it didn’t work well for me.

I used metal washers painted with rubberized paint and one pound stones for weights.

I use an inkle weave to space warp.

My loom is made by two by fours and screwed together then stained dark.

The loom size is based on the area where I would be weaving

I work on the loom by myself, but broke my foot, so I’m getting one of my apprentices to do part of the weaving – I have fifteen apprentices that do weaving, spinning, lucet, combing the wool, processing flax, basket weaving, dyeing, pressing olives for public demonstration.

I saw a warp weighted loom in the Creation Museum in Hebron, Kentucky, which was set up and woven on by woman who had never seen or worked on one before.

Respondent 22: I did one project in 2005 in less than a week, so answered more than five years.

I learned from the warp weighted loom book. (referring to where she learned to weave)

I did a little bit of tablet weaving before taking on the (warp weighted) loom.

I have done some backstrap weaving.

I have also done 'some tablet weaving on an inkle loom, and some on a 'loom' which involved bits of wood with padding attached between which the project gets clamped and stretched taut. I have also done tablet weaving edges on fabric for sewing projects by pinning the project to one pillow in my lap and the yarn to another pillow letting the fabric (weaving already done part) pillow dangles a bit off my lap to provide tension.'

I also embroider, hand sew, naalbinding is habit-forming, and I have played a bit with sprang and want to do more.

I use a little belt/tablet weaving shuttle for a beater.

I have used a warp weighted chair.

I used yarn I had in the house at the time.

I used spice jars for weights.

I didn't use a spacing method.

My loom was a chair tipped over on its side.

Respondent 24: I used bags of sand for my weights.

Respondent 23: I used Hoffmann's book and a lot of experimentation, because she doesn't do well with written instructions.

I spin, embroider, sew, some knitting, felting, and natural dyeing.

I usually use drop spindle hand spun wools for weaving with.

I used a weaving sword and tapestry beater for beating with.

I used whatever style of fired weights I could get a potter to make, possibly flattened triangular?

I have three looms, two lean against the wall, and one is a reasonably accurate working miniature about three feet high with a frame for demonstrating in primary schools.

I have a five foot wide loom and another is nine foot wide which I used to make a cloak in one piece as an experiment which is currently on semi-permanent loan to the Kirkleatham museum as part of a Saxon princess exhibition, but there is no room to weave there, and a mini loom made purely to fit into the back of her van which gets almost daily use.

Respondent 25: I haven't woven for about four years.

I learned to weave from another member of my re-enactment group.

I also do dyeing and naalbinding.

'Both looms I has used were not built to specific researched dimensions, but were made of a large enough size for two people to work on them. They were also built tall enough so that when working at the top of the loom it is necessary to stand on a bench, as they were still used in Scandinavia early in the 20th century.'

My heddle loops were a single line of linen thread that wasn't long enough, so I had to add two more lengths to get it long enough.

Respondent 26: I do naalbinding.

First I used mugs, then cars' ball bearings for weights.

Respondent 27: I set up three looms for a movie set, then left them there with the weaving on.

I used inkle weaving to space the warp.

The looms size was based on a weaver being able to work standing, and still be able to move around the set.

Respondent 29: I have used rigid heddle and inkle looms.

I only use a pin beater sometimes for clearing a shed, not beating.

I only use hand spun for weft.

I own two weights, which were pit fired, for the card woven borders.

I used card weaving for both starting and edging borders.

Respondent 31: I only use the loom infrequently.

I already used floor and inkle looms and learned the warp weighted loom because it was a new (to me) fibre art.

I learned the basics from a teacher and a book at a university class, but practical application came from experimentation and YouTube about fifteen years later.

I know crochet, needle tatting, kumihimo and lucet.

I have tried double faced weaving.

Respondent 32: I use teardrop fired weights.

Respondent 33: I use a shuttle edge for a beater.

I use crochet cotton for yarn.

I use marbles in zip-locks as weights.

I use large hair clips over the top rail and book rings set in a suspended chain for further down.

My loom is made of Metro shelving.

I use tablet weaving cards made of wood or cardboard or leather for heddles.

Respondent 36: I've been a weaver for twenty years, a spinner for longer, and part of Society for Creative Anachronism for even longer.

I also do bobbin lace, crochet, almost everything, except tatting.

My loom was made of bolts and wing nuts, modern varnish, decorated with a small modern motif.

The loom's size is based on directions given in the book *Opstandvaev for og nu by Egon H. Hansen*.

Respondent 43: I have been weaving less than a month.

I had a burning desire to have one as soon as I learned about them.

I learned twined weaving the previous year, and am learning band weaving.

I have tried twined weaving based on local Native American practice, small rigid heddle looms, and pot holder looms.

I repair and restore antique wheels.

I also crochet and felt.

My hands work pretty well for the beating up of weft.

My current project is doubled warps and single wefts.

'First set of weights was made of ceramic, fired to cone 5. These weights were made before I had enough data to work from, and they are too light for what I am weaving now. The ceramic weights are all less than 100 grams versus the stone weights I made and am using now, which average 400-450 grams each. (I'm using twenty four of them on my present project, a weaving about 75 centimetres wide. This is about the max working width I can weave on the present beam.)'

I wove a heading band using a Scandinavian band loom.

I tried to make loom handsome and function like an ancient loom, but it is not historically accurate – used modern materials and tools to make it.

My loom is very narrow compared to old Scandinavian examples. This was mostly done out of ignorance, as I did not have examples to look at when I built it. It is also narrow so that I can set it up in the small space in my living room, and can easily weave on it by myself.

It is also low enough to sit on while I am working.

'I knot my heddles, I think. I keep hearing "heddle knitted on." I don't know how to do that, but would love to learn!"

Respondent 44: I tablet weave, sprang, loop braiding, other braiding, naalbinding, crochet, and macramé.

I have also done double weave on my warp weighted loom.

I have one piece that I have turned into hats, and multiple other pieces to experiment with new yarn or for teaching. I have tons of teaching warps around the house labelled for when the class was taught.

I use commercial spun wool in sizes ranging from cobweb weight singles to four ply worsted knitting yarns, depending on whether I am experimenting or teaching. The most correct to early medieval standards results were 2/26 warp and 10/2 weft.

I use a different coloured warp/weft when teaching, and the same coloured warp/weft when experimenting.

I have doughnut shaped unfired grey clay (Marblex Air-Dry) correct for 10th century Jorvik. I also netted bags of stones, canvas bags of sand. My Greek loom has a 120 piece matched set of fired terra cotta pyramid type based on 4th century BCE finds from Macedonia.

I do either card or warp faced tabby weave, then doesn't need to do anything else to space the warp.

Appendix 3: Questionnaire Responses: Short Answer

Question 1: Why did you start weaving with this tool?

Respondent 1: There was a loom not really being used at the ARC in York. A group of us whilst I worked there wanted to get it used more and produce cloth properly. I have since started using a different loom at re-enactment events.

Respondent 2: Needed a loom that was larger than my other ones that could accommodate a longer warp.

Respondent 3: I bought the loom one and a half years ago at a charity auction at a re-enactment training event. I have woven at one show and the rest of the fabric at home. My home is too small for it so to weave I have to move furniture around, so I haven't done as much work on it as I have hoped. I am in the middle of setting up a fine linen (I think) fabric with a tablet woven start, but spent most of the time sorting out the roll of fabric into weavers hanks and re-spinning any plying a new extra long heddle string. And that's as far as I have got.

Respondent 4: Wanted to be doing something different at living history events.

Respondent 5: I saw one being used and was fascinated by the process and possibilities.

Respondent 7: I am interested in Norse history and I am complete fibre geek. I particularly love textile history. It was a natural extension in interests that already existed.

Respondent 8: I was fascinated by the concept and technology.

Respondent 9: I am a member of a historical re-enactment group, and was in Manchester when there was a major gale and many trees blew down. Some had forks which made them good material for making warp weighted looms. As I was interested in textile history and textile crafts I got out an axe and made myself a warp weighted loom. My first loom was weighted with rocks from a stream bed in a park retrieved with permission from a park ranger who was helping organize a re-enactment show.

Respondent 10: Soon.

Respondent 11: I'm an archaeologist with an interest in prehistoric textiles.

Respondent 14: In Waxahachie, TX, where I live, we re-enact the birth of Jesus. We have about 200 volunteer re-enactors with live camels, donkeys and other animals. In all the huts that are within the city, I am the weaver there and am in charge of manning the weaver's hut, the dyer's hut, the basket weaver's hut, the flax field, and the olive press. For years I used an old barn loom (this is our 15th year for putting on the re-enactment), but when I found out information on the wwloom and my husband agreed to build it for me 6 years ago, I started using the wwloom. I try to do different things – I have made rugs, curtains, and over garment to wear. This year I am making covers for some large pillows to replace the ones that the moths ruined.

Respondent 15: I wanted to learn how to tablet weave and the looms for tablet weaving were too expensive to buy premade, and seemed clunky. I looked at other loom options and came up with the modified warp weighted loom I use currently.
Respondent 16: I was very interested in connecting with my Norwegian roots. I wanted to know how my Norwegian ancestors wove, and then I found an opportunity to take a warp weighted weaving class at the Vesterheim museum in Decorah, IA.

Respondent 17: I have been working with textiles for a number of years, simply for personal interest. I wanted to try a warp weighted loom due to my personal research in the Iron Age Levant; experimentation with warp weighted looms became an essential part of my research.

Respondent 18: I was asked to participate as a weaver in a re-enactment demo. I explained that dragging out my somewhat portable 4 harness jack loom wasn't really historically accurate especially for the time period I was interested in. I was talked into making on that was (wwl). Explained that wwl typically aren't free standing, depending on walls, was talked into making one that was capable of being put up in the road.

Respondent 19: For a special event in the Surrey Archaeological Society's 150th anniversary year, which provided an opportunity for something I'd been wanting to do.

Respondent 20: Because I was curious how the loomed worked.

Respondent 21: I wanted to learn the weaving technique used in Iron Age in Finland and in Baltic and Scandinavian areas. To recreate ancient Finnish dresses as they were done.

Respondent 22: Because it is very interesting to me, more authentic for early period clothing, permits wide fabrics, and I am fascinated by tablet-woven start and want to try it.

Respondent 23: To help with a museum exhibit my living history group were doing at a local (now defunct) museum – it was a six month display.

Respondent 24: I am part of a local group of historical re-creationists who do an annual demo at a modern fibre festival. I wanted to add to the recreation aspect of our demo, and present something that the modern people were not likely to have seen, so my best friend and I made the loom from old barn timbers I was able to locate.

Respondent 25: I had been doing tablet weaving and dyeing for a few seasons of re-enactment and wanted to try something new. One of the other ladies in the group had been taught by her mother and had a loom but hadn't really done much. She taught me and we used to work the loom as a pair.

Respondent 26: I was interested in that kind of stuff.

Respondent 27: I was commissioned to set up the loom for a film set in biblical Israel.

Respondent 28: I started as a favour to a friend who worked at Castell Henllys, Pembrokeshire.

Respondent 29: Demo at Norstead Viking Village in Newfoundland in 2000.

Respondent 30: Because of my participation in the SCA.

Respondent 31: Love of weaving in general.

Respondent 32: To try it, to see how the finished product was different.

Respondent 33: A) I didn't have any loom or warping board and I wanted to use much longer warps than backstrap style would easily allow. B) I wanted to be able to forward turn my border cards all the way along the three yard strip without building up too much twist.

Respondent 34: I started weaving because I am a member of a Norse living history group and the SCA.

Respondent 35: The warp weighted loom always looked interesting, especially from my perspective as a 1rst century CE Roman re-enactor.

Respondent 36: As a 'fibre person' I wanted to have an accurate tool for a 10th c. Viking display. Plus I was curious. This was a number of years ago before I joined a 14th c. re-enactment group.

Respondent 37: I began because the Viking Hjem in Elk Horn, Iowa, had one that had never been set up and used before. I set it up in order to have a piece of cloth on it to show the public.

Respondent 38: I was doing a lot of Scandinavian textile research and started doing some projects with historically appropriate equipment.

Respondent 39: I began weaving with this tool because I'm fascinated with early Scandinavian history and my husband and I are very active with our living history group. This loom was also very simple for my husband to make for me so it was not a large financial burden to learn how to weave on.

Respondent 40: My wife developed an interest – but damaged her shoulder so I started to learn. It was part of our re-enactment of the Viking and Saxon period.

Respondent 41: Because it is how Viking Age Scandinavians wove. That is my main area of interest (in a hobby sense).

Respondent 42: I was interested in what occupied the time of medieval women. One of my undergrad professors volunteered to make me a loom for an upcoming

educational display put on by the Medieval Society, if I gave them a finished piece of cloth when I was done. Another of the professors, a potter, made my weights.

Respondent 43: A person on Ravelry suggested I might enjoy Barber's book, 'Prehistoric Textiles'. As I was reading it this summer, I became fascinated by the warp weighted looms described in the book, and decided I wanted one! I am ethnically Norwegian, and some of my family comes from Western Norway, wher the loom never quite went out of fashion. I feel a wonderful sense of connection with my deep ancestry when I work with this tool.

Respondent 44: Originally? I wanted to be able to understand all aspects of the process of making Viking clothing from raw fibre to post-construction ornamentation.

Question 2: Do you enjoy it?

Respondent 1: Yes.

Respondent 2: Yes. It's great.

Respondent 3: I love it. I notice I cannot do much at a time as my arm muscles are not used to the movement of beating with a sword. Also the sound resonates thought my wall, so I have to keep weaving to reasonable hours. I love seeing the fabric come into existence and the uneven ness of it. I do not like it that much when the warp threads break or the separator thread gets felted stuck.

Respondent 4: Yes.

Respondent 5: Yes.

Respondent 7: Yes, I enjoyed it. I love the challenge of learning. I found dressing the loom to be more fun than weaving on the loom. I can see why the wwloom did not last when the technology changed.

Respondent 8: Yes.

Respondent 9: Yes, but I have a busy job and don't get much time for weaving.

Respondent 10: I will – I have been weaving in some form or other for 15 years.

Respondent 11: Very much so.

Respondent 14: Yes, I do, although my upper back and shoulders get awfully tired after doing it for a solid 3 hours.

Respondent 15: Yes, and no. I love the finished product and if I can get into a rhythm I even enjoy the weaving itself. I hate the warping up of the loom part of weaving.

Respondent 16: Yes, I do. It is quite a workout.

Respondent 17: Yes, though it is time consuming and can be a strain on the body.

Respondent 18: I enjoy engaging with others in the weaving but doing so causes the weaving to be haphazard at best. I'd like to make one just for me at home. Just need time and space.

Respondent 19: Mostly.

Respondent 20: Yes.

Respondent 21: A lot!!!

Respondent 22: Well, yes, but I am not certain my tiny hint of experience is enough to say, really.

Respondent 23: Unless I get in a knot!

Respondent 24: Yes, though it's not likely to ever be my first love among fibre hobbies. I think of myself as, first, as a tablet weaver, then a spinner and weaver. Wwloom weaving would fall in there.

Respondent 25: Yes.

Respondent 26: Yes.

Respondent 27: I found this loom interesting to use and it was educational to set up. I did a lot by trial and error (number of threads on each weight, angle of loom). It is not the most ergonomic loom to use, my arms and shoulders got tired…Maybe the loom was too tall, or I needed to stand on something to get it started.

Respondent 28: Yes.

Respondent 29: Yes, but I enjoy other looms more.

Respondent 30: Very much, but it is inconvenient, because the loom takes so much space.

Respondent 31: Yes, I find it very organic and stress relieving.

Respondent 32: Sometimes.

Respondent 33: Mostly, it was a huge learning experience.

Respondent 34: As a matter of fact, I do enjoy it once it is all warped

Respondent 35: I find the loom very challenging, and am humbled by its complexity. And yes, I enjoy it.

Respondent 36: I enjoyed working with it at the time and was pleased that a few teen-aged girls were willing to take over the weaving and experiment with it. The site was damp, though, so it was very difficult to get a good shed with the damp wool warp.

Respondent 37: Yes, very much.

Respondent 38: I like weaving of any type, but vertical looms are physically difficult for me.

Respondent 39: I wouldn't keep doing it if I didn't. It's a labour of love as it seems that a horizontal loom would be less labour intensive.

Respondent 40: Yes – there is always so much more to learn.

Respondent 41: YES!

Respondent 42: I like it well enough to finish four pieces. A fifth one is currently on the loom. I do tend to experiment a lot with each piece, adjusting the heddle loops, experimenting with warp tie ups, and different patterns with each piece. I figure I've adjusted the heddle loops at least a dozen times.

Respondent 43: I LOVE IT!

Respondent 44: I have enjoyed the challenge of trying to work out how to weave a four-shed twill in the historic Icelandic fashion on my repro Icelandic style loom. I don't want to figure out 'a way that works', I want to figure out what the actual dance was based on the oral sources, the archaeological sources, and what the string tells me when I warp. I also enjoy trying to figure out if there is an elegant way to produce on that loom some other Viking Age weaves like the figured wool/linen double weaves. But that is all frustrating to try to work out, on my own, in my very limited spare time. So I also enjoy just rigging it for tabby and producing actual usable cloth! I enjoy teaching the mechanics of it (weaving a header band, dressing the loom, learning to create the sheds, the whole set of skills) to others also.

Question 3: Where did you learn to use the warp weighted loom? Who was your teacher?

Respondent 1: The ARC in York – a group of us figured out how to set it all up rather than having a teacher as such. Subsequently I've taught other volunteers there (whilst it was still there).

Respondent 2: Self-taught.

Respondent 3: My teacher was… from the Vikings.[382] She also made the loom herself. She went through the basics for an hour or so when I bought it off her. Apart from that I am self-taught, and no doubt will have an interesting time when I start setting u the next project onto the loom.

Respondent 4: Taught myself.

Respondent 5: My husband and I did research and experimentation. We had no teacher.

Respondent 7: My overall weaving teacher was… . We figured out together how to dress and weave on this loom.

Respondent 8: Self-taught from book: The Warp Weighted Loom by Marta Hoffmann.

[382] Some respondents named their teachers. The names have been removed due to ethics concerns.

Respondent 9: I learnt from Marta Hoffmann's book and an article she wrote on weaving among the Lapps.

Respondent 10: My SCA Laurel and other fibre enthusiasts and experts in the Kingdom of Atenvelt.

Respondent 11: Figured it out from the pictures in various books (this was the late 1970's and early 1980's, so in the days before the internet. I had to use interlibrary loan a lot).

Respondent 14: I didn't have a teacher – I read about it on the internet and in Marta Hoffmann's book. I have to reread it every time I set it up again, to make sure I do things in the right order.

Respondent 15: I used the internet to research looms and weaving methods. I have since purchased a few books but have not tried anything but tablet weaving.

Respondent 16: I found an opportunity to take a warp weighted weaving class at the Vesterheim museum in Decorah, IA. Our teacher was … from Bergen.

Respondent 17: I had discussions with… a professor at University of New Mexico Gallup. However, most of my work is based on papers published by the Center for Textile Research in Denmark and Marta Hoffmann's book *The Warp-Weighted Loom*.

Respondent 18: Mostly from book and took a few experiences on how not to from the internet. I have recently taken a class from … which I plan to incorporate some of the warping process for twills.

Respondent 19: At the home of a retired farmer and weaver who had also been wanting to make one. We taught ourselves from Hoffmann 1964 and got advice from various individuals.

Respondent 20: I taught myself by trial and error.

Respondent 21: I searched info from internet, books and asked other weavers, tried myself with the loom I made.

Respondent 22: I forget her name – the one who wrote the Warp-Weighted Loom book.

Respondent 23: Self-taught.

Respondent 24: I've picked up information, here and there, for many years. The one class where I learned the most – warping the loom, specifically, as well as hands-on general weaving – was taught by ….

Respondent 25: Friend from the group showed me. I learnt mainly during public shows.

Respondent 26: Learned by myself.

Respondent 27: I looked online and read anything that I could find. I was not able to get a copy of the warp weighted loom book, although I did try some. As I have been weaving for over 30 years, I knew what the parts had to do, I just needed to figure how best to make them do it.

Respondent 28: Self-taught and advice from a friend.

Respondent 29: Self-taught to begin with, using M. Hoffmann. Learned some and shared ideas with … and resident weavers at Norstead Viking Village, and L'anse aux Meadows, in Newfoundland.

Respondent 30: I taught myself using and internet site and Marta Hoffmann's *The Warp-Weighted Loom* as reference material.

Respondent 31: University of Wisconsin, Superior in 1987.

Respondent 32: Books ineffectively, then a class.

Respondent 33: Made it up as I went along.

Respondent 34: I have the book on warp weighted looms. I have a very good teacher… and was looking on the website to learn.

Respondent 35: At home, with a copy of Hald, a good friend, and some wine when knitting the heddles proved VERY time consuming. The Hald book was my teacher, along with a very few Greek vases seen online, and some classical reading (translated to English).

Respondent 36: *The Warp-Weighted Loom* by Marta Hoffmann, and *Opstadvaev for og nu* by Egon H. Hansen.

Respondent 37: I taught myself with an internet page. Since then I have gotten a better book that had made me rethink some of the techniques I use.

Respondent 38: I experimented from pictures in books until I got something to work.

Respondent 39: I found Marta Hoffmann's book for sale by someone who didn't know what they had. I think the Fates were watching. After that I talked to the couple of people I knew who did weaving and took a couple of classes at a living history event. It was very much a self-taught process to see what worked and what didn't.

Respondent 40: At home and re-enactment events. I am self-taught.

Respondent 41: I taught myself. I already knew how to weave decently, and so I tried it.

Respondent 42: I had no teacher, and no access to Hoffmann. I could only find two websites that showed anything about warp weighted looms. I had six weeks to engineer a working loom from a few images and what I knew about weaving from five years' experience and two classes.

Respondent 43: Learn by doing, for the most part. I built the loom and wove my first project based on the descriptions in Barber's book, and a single illustration in the children's book *Viking* (published by Eyewitness Books). AFTER I built the loom, I was able to get a copy of Marta Hoffmann's *The Warp-Weighted Loom* on interlibrary loan (I may have to buy a copy, bit it's $150 – yikes!). I also got Broudy's *The Book of Looms* which had good images which helped resolve a lot of issues I had with the first project.

Respondent 44: First I read Hoffmann's *The Warp-Weighed Loom*. Then in 1990 a friend made me a simple little wwloom out of a tree from his back yard; another friend who was a treadle loom weaver tried to help me set it up, but she couldn't grok it at all. Everything she told me to do was in competition with what I had read, and so we didn't get anywhere. I didn't have room for the loom in our small apartment, so I gave it away to another friend.

In 2000, I was invited by the American Museum of Natural History to bring a demo into the museum during the big Viking artefact exhibition that travelled there. I used this opportunity to work with my husband to produce a historically informed and workable loom that could be used both at home and in demos. (We had moved to a house by then, and we had more room.) We based it closely on extant Icelandic

and Greenland loom finds, particularly the broad shed rod and the cloth beam aspects.

The loom was built entirely in the field, all with hand tools and pre-modern measuring methods, during the SCA's Pennsic War in August of 2000. It took my husband about a week of leisurely vacation-type work with three friends lending him a hand from time to time. I have photos. It is all put together with tusk tensioning, plus holes with pegs. To make the teardrop cloth beam, he clued three pieces of wood together and then drew it down to shape with a drawknife. The loom is very rectilinear, built of dimensional lumber, but my husband didn't want it to look like it came off a rack someplace; he tried to pare, plane and otherwise disguise the original shapes of the wood. It was also designed to knock down and reassemble readily, which made it less rigorously authentic as an artefact but highly useful as a teaching aid. We made it usable both in the field (by giving it plantable heddle rod supports) and at home (by rigging a simple way to make the heddle rod supports work on our carpeted den floor).

Later that week I taught on it for the first time. I had done my homework in advance, working out how to warp this type of loom from Hoffmann's descriptions. I used her book plus her article from NESAT V which clarified the Icelandic oral material.

Then in 2001, when the Norwegian museum put online the original research films that Marta Hoffmann had made, I learned from them how to knit heddles a traditional way which made things much easier.

Everything else has been personal experimentation, since I was not aware of anyone else in the United States who was pursuing this kind of experimental archaeology. I have never found anybody else able to offer me any insights toward

the goal of weaving twill in the old Icelandic style on the proper loom. I took my classes along with me on the experiment, telling them that I hoped each of the would be able to contribute something to the pool of knowledge on this technique.

I have taught over a hundred people in my 12 years of teaching the warp weighted loom. Mostly that has been through offering workshops in the field at SCA events, although I've taught indoors, including a few times I've had people come into my home. But mostly I taught in my Viking clothing, outdoors under a shade tent with the loom leaned against a crossbeam that my husband rigged up across the shade tent for this purpose. Levelling a loom properly becomes very important in the field, particularly when one's ancestral encampment is on a one in six slope!

For a while I tried to keep some kind of record of who my students all were, where they were from, but after a while I just gave up trying to keep track of it. Instead, I just made sure I kept the teaching warps.

Question 4: What difficulties have you had or learned from when setting up and weaving with the loom?

Respondent 1: None of the group of us knew what we were doing, but had a loom set up so we de-constructed it and worked out how it was going to work. Creating the warp initially was the biggest challenge, but realizing that if you loop it through it is much easier to control your front and back threads for a basic tabby weave.

Respondent 2: Having to be more careful about not tangling the warp when you advance the warp.

Respondent 3: From weaving on the loom, I have learned to fix broken threads and I have also made up my own way of attaching the weights on, for the purpose of transporting a loom easier and extending the warp. So far on setting up I have learned that you cannot pass a cone of thread through a tablet weaving shed, so all the warp threads need to be wound into hanks.

Respondent 4: Mainly getting the spacing correct when first setting up.

Respondent 5: Everything was trial and error, particularly card woven selvedges, spacing cord at the bottom and tying heddles.

Respondent 7: I think figuring out the correct tension when making the tablet woven header is important. The tension of the woven band will affect the spacing of the

warp threads. Selvedges are always my issue and it doesn't matter which loom I use! ;)

Respondent 8: No problems to speak of.

Respondent 9: Threads snapping. Sizing helps. Twill is better than tabby as threads rub less. I have seen many looms set up without spacing cords. I have always set mine up with spacing cords. I think it is impossible to weave a complete piece of cloth without the cords. I tried to weave pile weave on a warp weighted loom. Pile dangles down and interferes with the shed. I think this is better done on a two beamed loom where the weave progresses upwards. I find if I weave the same weave with the same yarn on a warp weighted loom comes out less even no matter how careful I am. This is because the beater regulates the warp spacing and keeps the rows of weft perfectly even on a modern horizontal loom. Selvedges are more inclined to draw in on the warp weighted loom. I have woven one piece with cords at the edge which I tied to the upright loom posts to keep the work spread out (kind of like tensioning the cloth on an embroidery frame). Another piece I wove with tablet woven selvedges and had the warp for the tablets draped over the outer pegs of the shed rod which tended to keep the edges from drawing in too much. Of course none of this will work if you draw the weft too tight. When demonstrating, I often let people weave a few throws of weft and I usually have to get them to loosen off the weft as they will try to lay it far too tightly in the shed.

Respondent 10: Reading the experiences and blogs of other warp weighted weavers and hoping to avoid most of the pitfalls.

Respondent 11: Mostly just unfamiliarity with the amount of weight it needs to get a clean shed. I kept underestimating it.

Respondent 14: There is always the problem of draw in – I am trying something different this year. As well as weighting the selvedge heavier than the rest of the warp, I am going to tie the selvedges to the uprights down low on the loom to see if that helps to correct the draw in. It is really helpful to put on the loom weights and work the cord to stabilize and space the front and back of the warp before knitting the heddles.

Respondent 15: This is my second generation loom. My original attempt was larger and the finished work spindle was square rather than round.[383] The square spindle tended to squeeze in the centre creating uneven tension in the warp. The larger loom was harder to work at and even though the working space was larger I seemed to have more waste thread in the warping.

Respondent 16: The piece I made in our class had quite a bit of draw in. So keeping even selvedges is difficult. I have some trouble getting the heddles even. I've had to take the loom apart quite a bit, moving to set up at a local Scandinavian centre and the Norse Hall. It is time consuming but satisfying work.

Respondent 17: The biggest difficulty I have had is maintaining the proper warp width while weaving.

[383] I believe this respondent means the cloth beam here.

Respondent 18: Evenly spacing warp threads was difficult at first. I've switched to weaving them into a tablet woven band. I've also had problems with what I use to provide tension along the bottom not slipping very well. I haven't had much time to play with the issue. Right now I'm using a very sturdy thick line linen but I haven't gotten far enough again to know if it is resolved the issue.

Respondent 19: Waisting. The current piece is going well in this respect but I haven't identified what has made it better. Keeping heddle length even when in use. Getting good sheds for twill.

Respondent 20: Getting a non 'sticky' warp and keeping the warp from narrowing.

Respondent 21: In ancient Finnish textiles the tubular woven selvedge is used a lot and combined to tablet woven starting. This results problems in twill weaving, after starting the fabric easily tends to narrow. Most modern sheep breeds don't have as good wool for this weaving technique as the old ones, so getting right kind of wool is not so easy.

Respondent 22: It isn't so easy to get things to work when hanging the warp from chair legs on their side, but it is doable in the small scale.

Respondent 23: I've had problems with the sides pulling in from time to time.

Respondent 24: The difficulties I've had with set-up and weaving are mainly based on the fact that I use this for demonstrations, and thus spend a lot of time putting up

and taking down the warp, with little chance to actually concentrate on weaving. Inevitably, the threads get somewhat tangled, and shift on the heddle beams while they are in storage. And my loom weighs a *lot*, thanks to the old barn beams and the lawn timber I use as a cloth beam. *That* needs to be swapped out, sometime soon.

Respondent 25: The main difficulty for us was the amount of time it took to set up the loom. Most of our public shows were weekends, and it took most of one day to complete the set-up.

Respondent 26: Putting thread through the curry comb.

Respondent 27: The top beam was not smooth (the looms were built for me by the set designers and we needed to make some adjustments). The angle of the loom needed to lean back more to get a shed, and the heddle rod holders were not long enough to easily weave. We adapted the looms to have them work. I had to experiment with the length of the heddles also.

Respondent 28: Tendency to draw in.

Respondent 29: Draw in, and not setting the warp densely enough.

Respondent 30: After getting the warp on the loom I was stymied for a while by knitting the heddles and chaining the bottom, but once I got started it wasn't as hard as I thought.

Respondent 31: I still pretty much bumble along learning as I go.

Respondent 32: Remembering how to knit heddles, getting them to be an even length, transporting was not good and there was lots to redo.

Respondent 33: A) Make sure the warp doesn't start out twisted. B) Fishing swivels attached between the end of warp and 'extender' cords really help undo the twist – especially if A) is observed. C) Keep the warp path free of snags as possible. Also: taking the warp off when the loom needs to be broken down is fraught with difficulties and … style plastic bag clips are a godsend.

Respondent 34: Once it is set up I have no problems. It is getting the loom warped and set up that is the hardest part.

Respondent 35: Sewing the card woven top selvedge directly to the loom did not work. I ended up sewing it very thoroughly to a rod, then lashing that to the loom via the holes originally intended to support the top selvedge. Knitting the heddles to balance the distance from the heddle rod was challenging. Keeping the loom weaving evenly means making absolutely certain to regularly adjust the warp bundles tied to the loom weights. The choice of heddle material is problematic, as the 20/2 linen I used tends to wear on the heddles, and a fine heddle was fragile. This was resolved by using four threads together as the warp and weaving a sort of basket weave, instead of a single thread tabby, or a twill. At first, keeping the weaving parallel to the heddle bars was problematic, until I figured out the right balance of warp threads per stone. This involved weighing the stones and noting it on them

(mine are soapstone, carved by my husband) and making a reasonable estimate of the number of threads said weight could handle. I rebalanced them at least three times over a period of four months. The original heddle supports were too short, making it very difficult to obtain a clear shed. This was remedied by remaking the supports longer, and also by making more pairs of holes in the uprights so the heddle height could be adjusted to better fit the weaver and the angle of the loom.

Respondent 36: I found that making the warp as a long fringe at the edge of a tablet woven band was exceedingly easy to do! I found that keeping the work from drawing in was difficult. I also found that beating the weft into place by beating UP was weird.

Respondent 37: I have learned you must use linen heddles when weaving with wool to avoid cling. I also need more weights than I currently have.

Respondent 38: I cannot work standing or with arms up, so this limits my ability to use vertical looms.

Respondent 39: My first project did not have a starter band and the horizontal take in was atrocious. The tension is quite different to work with than the rigid heddle loom and obviously the tablet or inkle.

Respondent 40: Types of wool – some are more likely to stick together. The main difficulty was working out the best method of moving it and storing it when not in use.

Respondent 41: I need better weights, that it was actually pretty easy, that is was easier with two of us.

Respondent 42: I didn't have access to Hoffmann when I started, so I back engineered from the floor loom. I was surprised to discover that the accepted method included two lines of warp weights. I've since seen archaeological evidence for the use of a single line of warp weights. I've set up the heddles on many occasions and rearranged my weights as many times. I've discovered that a single line of weights is a good option for more intricate weave patterns. The videos only recently made available on the Nordic Folk Museum website has finally answered some questions about heddle tie ups.

Respondent 43: Lack of easily available information and good pictures. The first project was fascinating though, in that by NOT having enough information, I was forced to really think about it and try to understand the principles of how the loom needed to work. The first project was sort of awful (crazy warps out of control!) but I was happy with it anyway. My first foray was probably worse than it might have been for others, since I am not at all a weaver by training.

Respondent 44: First I learned about how using the right, historically accurate thread makes a huge difference. Modern woolen yarns, yarns with too little twist, or handspun yarns with too much kemp each produce their own set of complications that simply get in the way of learning what I wanted to learn. I never have gotten the hang of using the *skilskaft*, the shed rod you use to make the fourth shed when working in the Icelandic fashion. That particular step of the dance continues to elude

me. More than anything else, that's the barrier that's kept me from becoming a production weaver on this style loom.

Question 5: If you saw/used diagrams to assist with learning loom set up, how useful did you find them?

Respondent 1: At the time we didn't.

Respondent 2: Depended on the diagram, some were not from a good angle. But most were useful.

Respondent 3: Diagrams would be particularly useful for setting up twills. Setting up tabby is fairly straight forward. I think instructions in what order to set up the warp would be useful.

Respondent 4: Some web based instructions could be very confusing.

Respondent 5: Very useful.

Respondent 7: I made my own instructions…lol…there were no diagrams when we started, just the one book 'Warp Weighted Loom' and a few websites.

Respondent 8: Very useful.

Respondent 9: Hoffmann's diagrams of how to knot on the heddles and spacing cords were very useful.

Respondent 10: They are quite useful, but nothing beats seeing one in action!

Respondent 11: Very much…of course videos would have helped, but they weren't available at the time.

Respondent 14: They were very useful.

Respondent 15: While there are several pages on the internet devoted to weaving, the images of the looms and their set ups are not always very clear. I found the set up on …'s site the most useful, even though I did modify it to allow me to weave sitting directly in front of the loom. On top of that, I tablet weave so have trouble getting the s and z threading on the cards correct.

Respondent 16: The loom I have was made by the … company. As I understand it, it was designed for use by weavers due to some classes taught in the Seattle area at the time. I was able to get my loom through Craig's List.

Respondent 17: I found images from the CTR publications to be very helpful.

Respondent 18: Didn't see any. I've drawn some for others.

Respondent 19: Useful in *The Loom of Circe* (Karen-Hanne Staermose Nielsen, Kirkes Waev, Lejre 1999).

Respondent 20: Most are pretty but not very helpful.

Respondent 21: Very useful, the few ones I found.

Respondent 22: Well, it worked.

Respondent 23: I have problems understanding written instructions so mainly I look at the pictures anyway.

Respondent 24: Moderately useful – my best friend and I worked from whatever diagrams we could find, and spent a fair bit of time sketching out our ideas as much as we could. And we still made different choices as we went along.

Respondent 25: Not applicable.

Respondent 26: Didn't use.

Respondent 27: I found a video of a woman weaving and that helped a lot. The material from the film studio was pictures of the pieces, but not set up to work (like a poor museum set up). Several of the sites online had pictures of a working model and that helped me. The best was using a number of different sites showing the loom from different angles so I could best judge what would work for my looms.

Respondent 29: Good enough to get a start and apply my knowledge of horizontal looms to this style of loom.

Respondent 30: Very useful, especially for knitting heddles and the actual construction of the loom.

Respondent 31: They worked for me and I have a large community of other weavers, though not really close by, to draw information from.

Respondent 32: They weren't, but I don't learn well that way.

Respondent 33: Somewhat, I didn't find anywhere the warp went up from the weaver, so I had to improvise.

Respondent 34: The diagrams, if they were done correctly, are easy to follow. I would like to see more step by step diagram.

Respondent 35: Some of the Hald diagrams were very useful, though the heddle knitting instructions were awkward and took a couple of hours to figure out. A glass of wine assisted by relaxing my mind so I could just follow the instructions instead of trying to understand what they were trying to do.

Respondent 36: The diagrams and pictures and photographs were pretty much ALL I used to set up the loom, so they were great.

Respondent 37: I am a very visual learner, so diagrams were very helpful.

Respondent 38: They were historical drawings, so not very useful but all I had.

Respondent 39: I found it very useful to figure out the broken diamond twill heddle set up.

Respondent 40: Usually quite difficult from books. But helpful as a starting point.

Respondent 41: That was all I had, so fairly useful. Some were better than others. :)

Respondent 42: The diagrams I had on heddles were not terribly helpful. If the heddles were set up like that, they slid, making for awful sheds. It wasn't until I saw the videos on the Folk Museum website that I finally understood that the heddle diagrams were not intended to show how to knit them on, but how to do a twill.

Respondent 43: Once I had a good picture (Anne Hanson sitting in her warping frame from Hoffmann's book, showing up again, nice and big in Broudy's book), I was off to the races.

Respondent 44: I think the single most useful diagram I saw was the one that showed me how weft becomes warp, i.e., how a header band is just a long tablet woven fringe. After that, everything made much more sense.

Question 6: What do you use for weft beating, and how do you use it?

Respondent 1: Iron sword beater based on the Coppergate find.

Respondent 2: I have a large beater made with a piece of scrap oak. It is about ¼ inch on one edge, and tapered to a wedge on the other edge. It makes it easier to pack in the warp.

Respondent 3: I have a long wooden weaving sword. I was shown to use it with holding the sword on one end, but I have found that I preferred holding it on both ends. Kentish style early Anglo-Saxon metal weaving swords seem to have been used that way, as there is a shot tang also at the tip end. I use the pin beater to separate the shed.

Respondent 4: I have a sword which is supposed to be an original medieval one, but I have my doubts and would think it probably dates to the 1930's.

Respondent 5: Short (about 12-25 inches) wooden sword shaped beater. Occasionally I use a longer wooden sword shaped beater. I beat one section at a time.

Respondent 7: So … had a weaving sword made by a friend, I used a really long batten. That said it was important to use the pin beater to really make sure your weft was beaten into place.

Respondent 8: I carved a sword beater from a cedar slat. I alternate hands when beating upward.

Respondent 9: I use the sword beater two handed inserting between threads and beating a section at a time. My beater is of oak and is based on a Norwegian Viking age whalebone sword beater. Beating a single throw of weft involves several operations as follows: a) Throw the weft. I use a weft skein rather than a shuttle, so I unwind enough weft from the skein for a throw then pass the skein through the shed. This involves pushing the skein into the open shed as far as I can reach then going to the other end, reaching into the shed and pulling the skein out. b) Rest the weft skein over the top beam with the weft lying in a long catenary curve in the open shed. c) Change the shed by moving heddle rods as appropriate. d) Beat the weft up roughly with fingers of open hand. Initially push up in the middle so there are two curves instead of just one, then push up about a quarter of the way in on either side so there are four curves, then just generally tap the weft up all the way along. e) Beat up hard with weaving sword, using one left hand to pivot and right hand to pull down on handle causing blade to go up. Beat at several places inserting sword between warp threads into open shed. Beat hard enough to make loom weights dance. f) Strum pin beater side to side to correct any uneven spacing in the warp threads.

Respondent 10: I will likely make a beater from a wooden yardstick with a bevelled edge.

Respondent 11: A weaving sword for the most part, and a pin to more finely adjust the placement where necessary.

Respondent 14: I use a wide hard plastic comb bought at Walmart in a dark color – it works very well for me. I have a wooden one like that that a man brought me back from Africa. The tines have blunt ends, so am not sure it will work, but am going to try it.

Respondent 15: I carved a weft beater from oak. I place it between the warp threads after I pass the weft through and tamp the weft thread into place. I also tamp once more after the cards are turned and before my next weft pass.

Respondent 16: It is similar to the sword beater we used in the class, but without the handle. I am interested in getting a sword beater made, but have not found a local craftsman to make on yet. The Norwegian booklet I have has some general instructions. We beat up on the weft every second or third pass.

Respondent 17: I use a 'sword' to push the weft up and then a smaller pin to distribute the weft as needed.

Respondent 18: Weaving sword. I beat up (relatively forcefully) after I switch sheds.

Respondent 19: I use a sword beater after changing the shed, so I beat the cross. How I push the weft into place before changing the shed depends on where I'm weaving. At home, with the loom I took to MEDATS in March 2011, I currently use a big, cheap, blue plastic hair comb, which happens to have the right spacing. In public I use a bone pin beater. When I demonstrate weaving at Butser Ancient Farm (Iron Age) I show alternative methods for placing the weft – fingers, a pin beater and a

replica antler ‘weaving comb’. I explain that this is controversial, and that some people think the combs found on Iron Age sites were used for combing locks of wool in preparation for spinning.

Respondent 20: Sword or pin beater, wacking the weft up either every throw (if needed) or every few throws.

Respondent 21: Homemade wooden beater sword, beat the weft to place.

Respondent 22: Because my project was so small, I used the same little wooden shuttle the weft was wound upon.

Respondent 23: Sword.

Respondent 24: I have both a tapestry beater and a sword beater, which I tend to alternate in using.

Respondent 25: A wooden weaving comb on every weft. Used to beat up the weft from one side to the other. Every 5/6 wefts we would then use a wooden weaving sword to beat up further to create more closely woven fabric.

Respondent 26: I use my hands.

Respondent 27: I wound a dowel for the shuttle and passed that across the loom. I then changed the shed and used a shed stick to beat the weft up into the web.

Respondent 28: Beating, I use my fingers then change the shed and use a stick for beating or a comb if there is one.

Respondent 29: Wooden sword, styled after an iron artefact. Insert in shed, beat upwards.

Respondent 30: My husband made me a weaving sword, and I swing it upwards against the weft. I also use my fingers to bring portions of the weft up in curves, and a comb to even things out when needed after beating.

Respondent 31: Weaving sword or empty shuttle depending on the width of the work, I use it gently and with my fingers to get the best density.

Respondent 32: Mostly pin (actually a naalbinding needle) some sword substitutes.

Respondent 33: I haven't needed anything other than the edge of the shuttle.

Respondent 34: I have a sword beater that I use. I use it by separating and beating it up.

Respondent 35: My husband hand carved a sword about 20 inches long to beat the weft. After changing the weft, I insert the sword, beat upwards firmly, then throw the shuttle and change the weft. I tried beating the weft on the open shed with spectacular failure. The thread just slipped right down.

Respondent 36: My carpenter made a boomerang-shaped beater from the Opstandvaev directions, but she used a light wood. I think it needed to be larger and heavier in order to get a good beat.

Respondent 37: I use a weaver's sword. I throw one weft, then beat it in.

Respondent 38: I use a weaving sword in a closed shed.

Respondent 39: My husband made me a sword beater which I use after I change the shed and before I pass the weft.

Respondent 40: I have several weaving swords, including one of whalebone. Usually insert it through the shed and use both hand, one at either end, to beat upwards in order to keep the weft level. I also use wooden combs (not yet obtained a bone one). Helps to separate warps and to beat down chaining at the bottom. Pin beater to deal with detail.

Respondent 41: I often use a very long shuttle (about 1 metre long).

Respondent 42: I use a long pick up stick I bought from the Ashford loom company. It has a wedge shaped profile and works like a weaving sword. I've also tried bone combs and find that that works better as it slides through the weft better. I always change the shed first, to trap the weft. It takes several 'hits' with a sword beater to pack the weft into place. I don't find pin beaters useful at all.

Respondent 43: Mostly my hands, occasionally a small sword beater that I made from a piece of driftwood. I find that on the current project (a striped weft-faced blanket I'll weave in two halve and stitch together, since my loom is so narrow) it is very easy to position the weft with my hands. I can grasp a handful of warps with my left hand and adjust the weft to perfect with my right.

Respondent 44: For Icelandic weaving, I use a wooden pin beater the size and shape of one of the finds from Period 4B at Jorvik (mid-tenth century, which is my area of greatest interest). I also use a wooden sword beater the size and shape of the early Norwegian whalebones one, i.e., the symmetrical broadsword shape. Like most of my textile tools, my husband made it for me. I sue the pin beater to help lay in the weft. I stroke the weft with it to help separate threads; I press the weft up in scallops so it won't draw in when it's beaten. I spot-check bits of questionable shed with it. If I'm weaving twill, which is most of the time, I only beat every fourth shed. I put wefts in the first three sheds, then use the *skilskaft* to get the fourth shed in. After that I open the first shed again and use the sword beater on the closed shed to gently urge the weft up. I never 'beat'. I apply only enough pressure to begin raising the weights. As a result, I do not get the pronounced weft-faced look that comes from over beating. I do, however, get a thread count result that is appropriate to the period textiles, and so I vigorously promote this technique as part of my teaching. There is no reason to what the crap out of one's cloth! If I'm weaving tabby on the Icelandic loom, I have to 'beat' every shed and apply more pressure, although I do it the same way as I do for twill, by gentle upward pressure of the sword beater held between my two hands. Interestingly, I am finding that as I weave tabby on the Greek loom I only

have to beat every second shed. I haven't worked out the reasons for that yet, and it fascinates me. It is an altogether different rig and rhythm from the Icelandic loom.

Question 7: What would you like to see from a book about warp weighted looms?

Respondent 1: Written in a clear simple language with both practical advice and the historical background.

Respondent 2: Instructions on how to make on, instructions on how to warp one. Period appropriate patterns that can be created on one.

Respondent 3: Pictures of loom set ups. Sizes, for example how widely distributed are the loom weights found in situ. Instructions on how to set up the heddle. How to weave neat selvedges and how to keep the fabric an even width. Sellers of yarns. Methods of setting up the warp on and off the loom. How to straighten a line of the weave and how to even out the warp in the middle of weaving. Info on the widths of historical warp weighted loom woven fabrics. Where leg windings (6-7 m long, 8 cm wide fabrics woven on a big loom or on a separate narrow/smaller version). Diagram on how to build a loom. Info on what type of clay and firing to use for hardy loom weights. What sort of weight was average for a cm/width of warp. How the weights affect the tightness of the weave. Pictorial Index of historical tools thought to be associated with weaving on a warp weighted loom, i.e. the different types of weaving swords and battens, pin beaters and combs.

Respondent 5: I would like a real beginner's book explaining every step clearly, with diagrams.

Respondent 7: Techniques need to be photographed in multiple steps. Explaining with words just isn't enough. If you are gathering information from the many weavers of the wwlooms, these people should receive full credit for their development work. The development of and experimental archaeology of the many techniques we are recovering is important work and should be recognized.

Respondent 8: Photos of looms currently in use.

Respondent 9: I enjoyed Hoffmann's book. *Kirke Vaev* is also good. I'd like to see any more examples of looms and associated tools which have been discovered. That is my preference, I know plenty of people who find Hoffmann too complicated and just want a simple primer. In fact, I know so many of those people actually wrote a short illustrated booklet on making, threading up and weaving on a warp weighted loom.

Respondent 10: Photos of looms in all stages of construction from all angles, and photos of looms in all stages of warping and weaving from all angles, and exact dimensions of all parts of historic looms.

Respondent 11: Practical information about setting it up for multi-shed patterns (twills and such).

Respondent 14: Photographs to help the newbie be able to set up and use the loom properly. Also, it would helpful to know the best angle to put the loom at, the depth of the knitted heddles, ways others have dealt with the draw in. How multiple shafts

are used – how to set that up. Showing how to use the weaving cards to do the selvedges. How others make their headers – I guess the experiences of other people would really be helpful, as that is how we learn – or at least I learn a lot that way.

Respondent 15: Clear diagrams of different loom set ups, weaving patterns, and directions for recreating the weave and material.

Respondent 16: I have the Marta Hoffmann book, and a booklet from Norway. They have everything I need. It's always nice to have something with how to instructions with good pictures. Sometimes different ways of explaining a process is just what you need to understand something.

Respondent 17: 1) A typology/history of material culture, perhaps expanding on Barber's. 2) Full explanation of how to set up a loom and use it. 3) Inclusion of the functional explanations from the Centre for Textile Research publications.

Respondent 18: I'd like to see both a 'how to' as well as a summarization of what can be seen from the archaeological evidence.

Respondent 19: The basic historical and technical information in Hoffmann 1964 and Stærmose Nielsen 1999 made easily accessible to English speaking readers. Hoffmann is a mine of information, but not easy to use. The *Loom of Circe* English translation has to be read in parallel with the Danish text which had the illustrations. It would also be good to have a substantial practical section on contemporary

experience of using the loom. I doubt if there would be a large market for it but this is no longer a problem with short-run print-on-demand publishing.

Respondent 20: Marta Hoffmann's is pretty good, adding the newest into from the various digs and reconstructions.

Respondent 21: The history, examples from different countries, info about the archaeological finds, new-found weaving techniques, step by step instructions and so on.

Respondent 22: A survey of the different styles, where and which each one is known from, and plans or detailed enough photos so that I could build any of them I chose.

Respondent 23: Most diagrams of how to arrange the weaving heddles/harnesses. I have worked out a way that seems to work for me, but I'd love to see alternative ways worked out, so that I can try them and see if there is another way that is better.

Respondent 25: Detailed step by step diagrams and explanation of how to set it up. I must admit that after a gap of several years I'm a little hazy on some of the steps now. Different set ups for differing weave types would also be useful. I never got further than a basic basket weave.

Respondent 26: How to do basic and advanced patterns and soumac technique.

Respondent 27: I would like sizes of the loom with an angle degrees needed. I know that several different sized looms can be used, but some kind of approximate; heddles this long, shed space this long, this much weight for each group of this many warps.

Respondent 28: Just spread the knowledge.

Respondent 29: I'm not sure if I would need/buy a new book on wwlooms. However, I think if it were to be practical and help weavers, it should include detailed and clear instructions on how to set up a warp using various methods and techniques. Clear diagrams on how to tie heddles. Lots of photos. I might like to see something between a modern weaving book/magazine and my favourite gardening book, particularly the trouble-shooting section at the back that has pictures to help recognise the problems.

Respondent 30: Lots of diagrams/pictures of both techniques and historic examples of looms, weights and textiles, examples of how to knit heddles for different twills.

Respondent 31: A better historical and geographical timeline for them and integrated with the loom, the technique and type/quality of the fabric result. I know the information is scanty but a real compilation of information in one place would be grand.

Respondent 32: I do not know. I learn so much better from a person that I am not sure what would be helpful.

Respondent 33: About the historic full sized looms, I'd assume you'd show all the pieces and the relationships among them and how they move during use. How one person uses the looms, how multiple people use the looms. Most craft books do not show how the full body is positioned and moved while the craft is being done – or even how the hands move through the entire sequence.

Respondent 34: More step by step and give actual period documentation of when and how it was used, actual grave finds.

Respondent 35: Region specific information on the weights, shapes, composition and dimensions of the weights. This should be correlated with the approximate width of the loom (at least, the distance the weights were spread across when found, and their numbers), fibre found if any and the sort of post holes found, if any, and the sort of post holes nearby, if any, that may have acted as a support for the loom. Period literary references, especially those not currently translated into English at this time would be most helpful.

Respondent 36: I would really like to have *Opstadvaev* in English!

Respondent 37: Lots of historical research.

Respondent 38: Practical problem solving, such as warp spacing, multiple heddle rod tie ups, header and selvedge techniques.

Respondent 39: I would like to see details such as heddle tying options or types of sizing that would have been used historically.

Respondent 40: Good diagrams which are easy to understand.

Respondent 41: Clear diagrams, encouragement that is easy and fun.

Respondent 42: Clear diagrams, better explanations of details. One of the books I read had very confusing diagrams for heddle tie ups, and when I approached the author, she was surprised the drawing was being used for that, as it was never the intention. But nothing else was available.

Respondent 43: Lots of good pictures! DETAILED pictures. Finished projects by a variety of different people working both to recreate historic textiles and those weaving contemporary cloth on an ancient loom. 'How to' type information. How to weave *Krokbragd* on a warp weighted loom. How to use a second heddle bar. How to knit heddles. How others have resolved the use of a temple on a warp weighted loom (I made copper 'claws' which I move down the weaving as I go, and which are tied to the uprights).

Respondent 44: From my perspective as someone interested in the history of the technique, there's an elephant in the room and nobody is talking about it. A lot of the work on twill weaving on the wwloom is based on either experimentation or speculation. Many people, even old timers and denizens of the best research workshops, don't stop to let enough of the actual historical information inform their

experiments. If you want to learn to weave twill on the warp weighted loom, how is it appropriate to set aside the information we have about weaving on the medieval Icelandic loom, when we know for a fact that millions of yards of twill were woven on that loom, likely in the same technique? Why make a 20th century Sami loom, a tool for weaving tabby blankets, and retrofit it like the Starship Enterprise to try to weave twill? It doesn't make sense to me. I think there's far too little attention paid to that kind of issue, even at the very top of the warp weighted loom weaving hierarchy. I understand, however, that this issue is being addressed a bit by some of the European research community; I would love for the subject to be more widely understood.

Glossary of Terms[384]

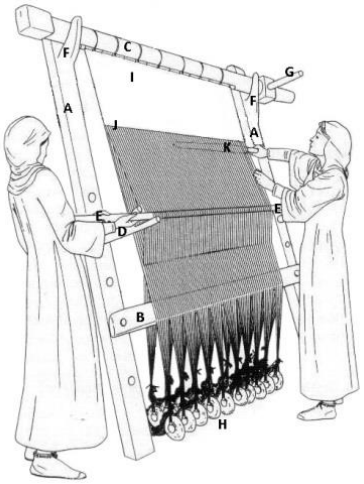

Diagram of Warp Weighted Loom. Based on a drawing from Penelope Walton Rogers *Cloth and Clothing*, page 29 (figure 2.21).

A. Loom uprights.
B. Shed bar or rod.
C. Cloth beam.
D. Heddle pegs.
E. Heddle bar. The attached heddles or heddle loops are not readily visible on this diagram.
F. Brackets or ratchets for cloth beam.
G. Crank shaft or spoke.
H. Warp weights.
I. Cloth.
J. Fell line.
K. Weaving sword.

[384] This glossary is based primarily on the glossary from Elizabeth Coatsworth and Gale R. Owen-Crocker, *Medieval Textiles of the British Isles AD 450-1100: an Annotated Bibliography,* British Archaeological Reports Series 445(Oxford: Archaeopress, 2007), pp. 31-48. Used with the kind permission of Gale R. Owen-Crocker.

Card: see tablet.

Cloth beam: A beam at the top of the loom that the woven cloth is wound around.

Comb: Toothed items used to beat weft into place, made of bone or antler, though wooden examples were also available at the time.

Fell line: The line where the weft and warp thread combine to create cloth.

Heddle bars: Long rods that rest in heddle pegs to which heddle loops are attached. Lifting the bars changes the shed.

Heddle loops: A device made of string which loops around behind a single warp thread, which is then tied to a heddle bar followed by another loop around a different warp thread, to allow for the lifting of a particular grouping of threads at the same time to create a specific weaving pattern.

Heddle pegs: Notched sticks to rest heddle bars in while the weft thread is being worked. They are grouped in pairs with one on each loom upright.

Loom: A frame used for weaving. For the purposes of this paper, three types of vertical looms are referenced. A warp weighted loom consists of a frame leaned against a wall or post which holds a beam upon which woven cloth is rolled. Tension is maintained by tying clay weights to the warp threads. A two beamed loom is a free standing vertical frame which holds two beams for tensioning the warp threads. A floor loom, also known as a craft loom, is a horizontal loom type, tensioned by beams with ratchets.

Pin beater: A tool wrongly identified with weaving, generally between five and thirteen inches long, with a diameter of one to two inches. Extant examples are made of bone or antler.

Reed: Originally made of split reeds, the reed is made up of wood slats or wires and simultaneously works as a comb for the warp, a beater, a warp thread spacer and a guide for shuttles in modern looms. Also called a sley.

Selvedge: The side edges of the cloth closed by weft loops.

Shed: A triangular gap created when some warp threads are pulled out from other warp threads to allow for the insertion of weft threads. Changing the shed occurs when alternate threads are brought forward, and other threads are allowed to return to the original position.

Shed rod: Serving two purposes, the shed rod keeps the lower section of the uprights spaced and also can create a natural shed when some warp threads attached to weights are hung in front of the rod, while others swing freely behind.

Sley: A weaver's reed used simultaneously to space the warp threads and as a beating in tool. It is a part of modern floor looms. Also called a reed.

Shuttle: A tool for holding weft threads while weaving. Weft is usually wrapped around the shuttle in a ball, though the thread could be wrapped along the length of the shuttle as well.

Sword beater: A long object made of bone, wood or occasionally iron, often shaped like a traditional sword, used to push weft threads into place.

Tablets: Usually small, square, flat plates with holes in the corners used to twine and weave thread into colourful patterns. Also called weaving tablets, weaving cards or cards.

Temple: A device designed to keep the selvedge edges of a cloth at the same width while weaving.

Thread/Yarn: Fibres twisted together, primarily of wool or flax through the early Medieval Era, though silk, hemp, nettles and other fibres were available. Thread is

thin and yarn is thicker, though there is no agreement on the exact diameter at which one becomes the other.

Uprights: Vertical beams of the warp weighted loom frame. Uprights have holes to hold heddle pegs and crotches for the cloth beam.

Warp: Threads attached to the loom under tension. Keeping thread under tension facilitates weaving. The term warp is used in both the singular and plural to indicate a single thread as well as the threads that encompass the width of the cloth.

Warp weights: Items specifically chosen to assist with weaving by put tension on the warp by being tied to bundles of warp threads. Also called loom weights.

Warping: The process of attaching the warp threads to the loom.

Weaving Cards: See Tablets.

Weft: Threads placed over and under the warp threads at a ninety degree angle to create cloth. The number of warp threads passed over or under by the weft threads dictate the pattern of the weave.

Bibliography

A Guide to the Antiquities of the Early Iron Age of Central and Western Europe Including the British Late-Keltic Period, no ed. (London: Trustees of the British Museum, 1905)

Ackerman, Susan, 'Asherah, the West Semitic Goddess of Spinning and Weaving?', *Journal of Near Eastern Studies* 67.1 (2008), 1-30

Addyman, Peter, 'Barley Hall: An Experiment in Archaeological Interpretation', *Public Archaeology* 1 (2000), 85-87

Addyman, Peter V., and D. H. Hill, 'Saxon Southampton: A Review of the Evidence. Part II Industry, Trade and Everyday Life', *Proceedings of the Hampshire Field Club and Archaeology Society* 26 (1969), 61-96

Addyman, Peter V., K. R. Fennell and L. Biek, 'A Dark-Age Settlement at Maxey, Northants', *Medieval Archaeology* 8 (1994), 20-73

Agnew, Vanessa, 'History's Affective Turn: Historical Reenactment and its Work in the Present', *Rethinking History: The Journal of Theory and Practice* 11.3 (2007), 299-312

Akerman, John Younge, *Further Researches in an Anglo-Saxon Cemetery at Long Wittenham, Berkshire, in the Summer of 1860* (London: J. B. Nichols and Sons, 1863)

-- *Report on Researches in an Anglo-Saxon Cemetery at Long Wittenham, Berkshire, in 1859* (London: J. B. Nichols and Sons, 1861)

Ambrosiani, Kristina, *Viking Age Combs, Comb Making and Comb Makers in the Light of the Finds from Birka and Ribe*, Stockholm Studies in Archaeology 2 (Stockholm: Göteborgs Offsettryckeri , 1981)

Amt, Emile, ed., *Women's Lives in Medieval Europe: A Sourcebook* (London: Routledge, 1993)

Anati, Emmanuel, 'The Way of Life Recorded in the Rock Art of Valcamonica', *Adoranten* (2008), 13-35

Andersen, Erik, and Anna Nørgaard, *Et uldsejl til Oselven: Arbejdsrapport om fremstillingen af et uldsejl til en traditionel vestnorsk båd* (Roskild: Vikingeskimuseet, 2009)

Anderson, Jay, 'Living History: Simulating Everyday Life in Living Museums', *American Quarterly* 34.3 (1982), 290-306

-- *Time Machines: The World of Living History* (Nashville, Tennessee: The American Association for State and Local History, 1984)

Anderson, Joseph, 'Notes on the Structure, Distribution, and Contents of the Brochs, with Special Reference to the Question of their Celtic or Norwegian Origin', *Proceedings of the Society of Antiquities of Scotland* 12 (1876-7), 314-354

Andersson, Eva B., 'Textile Tools and Production during the Viking Age', in *Ancient Textiles* ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 17-25

-- *Tools for Textile Production, from Birka and Hedeby: Excavations in the Black Earth, 1990-1995*, Birka Studies 8 (Stockholm: Birka Project for Riksantikvarieämbetet, 2003)

Andrews, Ethan Allen, Charlton Thomas Lewis, and Charles Short, *A Latin Dictionary Founded on Andrews' Edition of Freund's Latin Dictionary* (Oxford: Clarendon Press, 1951)

Andrews, Phil, ed., *Excavations at Hamwic, vol. 2: Excavations at Six Dials* (York: Council for British Archaeology 109, 1997)

Annandale, Nelson, 'The Survival of Primitive Implements, Materials and Methods in the Faroes and South Iceland', *The Journal of the Anthropological Institute of Great Britain and Ireland* 33 (1903), 246-258

-- *The Faroes and Iceland: Studies in Island Life* (Oxford: Clarendon Press, 1905; repr. 2009)

Arneborg, Jette and Else Østergärd, 'Notes on Archaeological Finds of Textiles and Textile Equipment from the Norse Western Settlement in Greenland: A Preliminary Report', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), 162-177

Ayers, Brian, *Excavations at St Martin-at-Palace Plain, Norwich, 1981* (Norwich: East Anglian Archaeology, 1987)

Barber, Elizabeth J. Wayland, *Prehistoric Textiles: The Development of Cloth in the Neolithic and Bronze Ages with Special Reference to the Aegean* (Princeton, New Jersey: Princeton University Press, 1992)

-- *Women's Work: The First 20,000 Years: Women, Cloth, and Society in Early Times* (New York: W.W. Norton & Co. New York, 1994)

Barber, Suzanne, 'Negotiating a Shire: The Transformation of Local Values in the Society for Creative Anachronism', *Folklore Forum* 41.3 (2011) <http://folkloreforum.net/2012/01/31/negotiating-a-shire-the-transformation-of-local-values-in-the-society-for-creative-anachronism>

Barlow, Alfred, *The History and Principles of Weaving by Hand and by Power* (London: Low, Marston, Searle and Rivington, 1878)

Bender Jørgensen, Lise, ‘Ancient Costumes Reconstructed: A New Field of Research’, *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), 109-113

-- ‘A Coptic Tapestry and Other Textile Remains from the Royal Frankish Graves of Cologne Cathedral’, *Acta Archaeologica* 56 (1987), 85-100

-- ‘Europe’, in *The Cambridge History of Western Textiles*, ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 52-70

-- *North European Textiles until 1000 AD* (Aarhus: Aarhus University Press, 1992)

-- ‘Northern Europe in the Roman Iron Age, 1 BC – AD 400’, in *The Cambridge History of Western Textiles*, ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 93-102

-- ‘Scandinavia, AD 400-1000’, in *The Cambridge History of Western Textiles*, ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 132-138

-- ‘Textiles of Seafaring: an Introduction to an Interdisciplinary Research Project’, *Northern Archaeological Textiles: NESAT VII*, ed. by Frances Pritchard and John Peter Wild (Oxford: Oxbow Books, 2005), 65-69

-- ‘World According to Textiles’, in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 7-12

Blair, John, and Helena Hamerow, eds., *Early Medieval Settlements: The Archaeology of Rural Communites in Northwest Europe 400-900* (Oxford: Oxford University Press, 2002)

Bosworth, Joseph, *An Anglo-Saxon Dictionary: Based on the Manuscript Collections of the Late Joseph Bosworth*, ed. by Thomas Northcote Toller (Oxford: Clarendon Press, 1898)

Bosworth, Joseph and T. Northcote Toller, *An Anglo-Saxon Dictionary* (Oxford: Clarendon Press, 1898).

Boyle, Angela, 'Weaving Equipment', in *Two Oxfordshire Anglo-Saxon Cemeteries: Berinsfield and Didcot*, ed. by Angela Boyle, Anne Dodd, David Miles and Andrew Mudd (Oxford: Oxford Committee for Archaeology for the Oxford Archaeological Unit, 1995), 228-229

Britnell, William J., 'How Upright Was the Warp-Weighted Loom?', *Antiquity* 51 (1977), 238-239

Brøgger, A. W., and Haakon Shetelig, eds., *Osebergfundet Bind 2: Utgit av den Norske Stat* (Oslo: Universitetets Oldsaksamling, 1928)

Broudy, Eric, *The Book of Looms: A History of the Handloom from Ancient Times to the Present* (New York: Van Nostrand Reinhold, 1979)

Bulleid, Arthur, and H. St. George Gray, *The Glastonbury Lake Village*, 1 (Glastonbury: Glastonbury Antiquarian Society, 1911)

Burke, Brendan, 'The Kingdom of Midas and Cloth Production', in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 64-70

Carnegie, Elizabeth, and Scott Mccabe, 'Re-enactment Events and Tourism: Meaning, Authenticity and Identity', *Current Issues in Tourism* 11.4 (2008), 349-368

Carroll, Diane Lee, 'Dating the Foot-Powered Loom: The Coptic Evidence', *American Journal of Archaeology* 89 (1985), 168-73

-- 'Warping the Greek Loom: a Second Method', *American Journal of Archaeology* 87.1 (1983), 96-99

Carson, Cary, ‘Colonial Williamsburg and the Practice of Interpretive Planning in the American History Museums’, *Public Historian* 20.3 (1998), 11-51

Cavell, Megan, ‘Looming Danger and Dangerous Looms: Violence and Weaving in Exeter Book *Riddle* 56’, *Leeds Studies in English New Series*, 17 (2011), 29-42

Chaoui-Derieux, Dorothée and Jean-François Goret, ‘Les Outils en Os du Haut Moyen Âge: État de la Question et Presentation d’une Experience en Cours’, in *L’habitat Rural du haut Moyen Âge en Île-de-France*, ed. by François Gentili and Annie Lefèvre (Guiry-en-Vexin: Centre de Recherches Archéologiques du Vexin Français, 2009), 79-92

Christensen, Arne Emil, and Margareta Nockert, *Osebergfunnet: Bind IV:Tekstilene* (Oslo: Utgitt av Kulturhistorisk Museum, 2006)

Cleasby, Richard, and Gudbrand Vifgusson, *An Icelandic-English Dictionary* Oxford: Clarendon Press, 1874)

Chan, Alexandra A., ‘Translating Archaeology for the Public: Empowering and Engaging Museum Goers with the Past’, *International Journal of Heritage Studies* 17.2 (2011), 169-189

Ciszuk, Martin, ‘The Academic Craftsman’, in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books), 13-15

Coatsworth, Elisabeth, and Gale R. Owen-Crocker, *Medieval Textiles of the British Isles AD 450-1100: an Annotated Bibliography*, British Archaeological Reports Series 445 (Oxford: Archaeopress, 2007)

Coles, John and Stephen Minnitt, *Industrious and Fairly Civilized: The Glastonbury Lake Village* (Somerset: Somerset Levels Project, 1995)

Collingwood, Peter, 'Neolithic Weaving Techniques', *The Journal for Spinners, Weavers and Dyers* 35 (1960), 39-42

Collis, John, *Winchester Excavations, Vol. II: 1949-1960* (Hertford: Stephen Austin and Sons, Ltd., 1978)

Cook, Alexander, 'Sailing on the Ship: Re-enactment and the Quest for Popular History', *History Workshop Journal* 57 (2004), 247-255

Cook, Robert, trans., *Njal's Saga* (London: Penguin Books Ltd., 2001)

Crang, Mike, 'Magic Kingdom or a Quixotic Quest for Authenticity?', *Annals of Tourism Research* 23 (1996), 415-431

Crockett, Candace, *Card Weaving* (Loveland, Colorado: Interweave Press, 1991)

Crowfoot, Elisabeth, 'The ? Weaving Batten from Hall 7', in *West Stow: The Anglo-Saxon Village, Volume 1: Text,* ed. by Stanley E. West (Ipswich: East Anglian Archaeology 24, 1985), 139

Crowfoot, Grace M., 'Of the Warp-Weighted Loom', *The Annual of the British School at Athens* 37 (1936-7), 36-47

Cunliffe, Barry, *Excavations at Portchester Castle, Vol. II: Saxon*, Reports of the Research Committee of the Society of Antiquaries of London (London: Thames and Hudson, Ltd., 1976)

Cunliffe, Barry, and David Baker, 'Excavations at Portchester Castle, Hants, 1969-1971: Fourth Interim Report', *The Antiquaries Journal* 52.1 (1972), 70-83

Curchin, Leonard A., *The Romanization of Central Spain: Complexity, Diversity and Change in a Provincial Hinterland* (London: Routledge, 2004)

de Groot, Jerome, ‘Affect and Empathy: Re-enactment and Performance as/in History’, *Rethinking History: The Journal of Theory and Practice* 15.4 (2011), 587-599

-- ‘ “I am Not a Trained Historian. I improvise.”: Jeremy Deller Interviewed by Jerome de Groot’, *Rethinking History: The Journal of Theory and Practice* 16.4 (2012), 587-595

Dickinson, Tania M., ‘An Anglo-Saxon “Cunning Woman” from Bidford-on-Avon’, *In Search of Cult: Archaeological Investigations in Honor of Philip Rahtz,* ed. by Martin Carver (Woodbridge: Boydell & Brewer, Ltd., 1993), 45-54

Entwistle, R. M. and J. Pearson, ‘The Conservation of 63 Anglo-Saxon Loom-weights’, *The Conservator* 20.1 (1996), p. 37-44

Drinkall, Gail, and Martin Foreman, *The Anglo-Saxon Cemetery at Castledyke South, Barton-on-Humber*, Sheffield Archaeological Reports 6 (Sheffield: Sheffield Academic Press, 1998)

Evison, Vera, *Dover: The Buckland Anglo-Saxon Cemetery*, English Heritage Archaeological Reports 3 (London: Historic Buildings and Monuments Commission for England, 1987)

Faussett, Bryan, *Inventorium Sepulchrale: an Accound of Some Antiquities Dug Up at Gilton, Kingston, Sibertswold, Barfriston, Beakesbourne, Chartham, and Crundale, in the County of Kent from A.D. 1757 to A.D. 1773* (London: Printed for Subscribers Only, 1856)

Fell, Christine, Cecily Clark and Elizabeth Williams, *Women in Anglo-Saxon England and the Impact of 1066* (London: British Museum Publications Ltd., 1984)

Feugere, Michel, ‘Métiers à Tisser Antiques d’Asie Mineure’, *Instrumentum* 30 (2009), 22-24

Fife, Wayne, ‘Semantic Slippage as a New Aspect of Authenticity: Viking Tourism on the Northern Peninsula of Newfoundland’, *Journal of Folklore Research* 41.1 (2004), 61-84

FitzGerald, Maria Amelia, ‘Textile Production in Prehistoric and Early Medieval Ireland’, 5 vols., (unpublished doctoral thesis, Manchester Metropolitan University, 2000)

Fox, A. L., ‘Excavations at Mount Cabourn, Sussex’, *Archaeologia* 46 (1881), 468-493

Fransen, Lilli, Anna Nørgaard and Else Østergård, *Medieval Garments Reconstructed: Norse Clothing Patterns* (Aarhus: Narayana Press, 2011)

French, David, *Roman, Late Roman and Byzantine Inscriptions of Ankara: A Selection* (Ankara, Turkey: Dönmez Offset, 2003)

Geake, Helen, *The Use of Grave-Goods in Conversion-Period England, c. 600-850* (Oxford: John & Erica Hedges, 1997)

Geijer, Agnes, *A History of Textile Art* (London: Pasold Research Fund in Association with Sotheby Parke, Bernet, 1979)

Gillis, Carole, and Marie-Louise B. Nosch, ‘Introduction’, in *Ancient Textiles,* ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), vii-x

Gleba, Margarita, ‘Textile Tools and Specialisation in Early Iron Age Female Burials’, *Gender Identities in Italy in the First Millenium BC,* ed. by E. Herring and K. Lomas (Oxford: Archeopress, 2009), 69-78

Goodacre, Beth and Gavin Baldwin, *Living the Past: Reconstruction, Recreation, Re-enactment and Education at Museums and Historical Sites* (London: Middlesex University Press, 2002)

Gostencnik, Kordula, 'The Magdalensberg Textile Tools: a Preliminary Assessment', *North European Symposium for Archaeological Textiles X*, ed. by Eva Andersson Strand, Margarita Gleba, Ulla Mannering, Cherine Munkholt and Maj Ringgaard (Oxford: Oxbow Books, 2009), 73-90

Guðjónsson, Elsa E., 'Járnvarðr Yllir: A Fourth Weapon of the Valkyries in Darraðarljóð?' *Textile History* 20.2 (1989), 185-97

-- 'Some Aspects of the Icelandic Warp-Weighted Loom, Vefstadur', *Textile History* 21.2 (1990), 165-79

-- 'Warp-Weighted Looms in Iceland and Greenland: Comparison of Mediaeval Loom Parts Excavated in Greenland in 1934 and 1990-1992 to Loom Parts from Eighteenth and Nineteenth Century Warp-Weighted Looms in Iceland; Preliminary Remarks', *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), 178-195

Haddon, Alfred Cort, 'Obituary of Henry Ling Roth', *Man* 25 (1925), 97-101

Hald, Margrethe, *Olddanske Tekstiler: Komparative Textil- of Dragthistoriske Studier paa Grundlag af Mosefund og Gravfund fra Jernalderen* (Copenhagen: Glydendalske, 1950)

-- *Ancient Danish Textiles from Bogs and Burials: a Comparative Study of Costume and Iron Age Textiles*, trans. Jean Owen, 2nd edn, Publications of the National Museum: Archaeological-Historical Series, 21 (Copenhagen: National Museum of Denmark, 1980)

Halewood, Chris, and Kevin Hannam, 'Viking Heritage Tourism: Authenticity and Commodification', *Annals of Tourism Research* 28.5 (2001), 565-580

Hamerow, Helena, *Excavations at Mucking: Volume 2, the Anglo-Saxon Settlement, Excavations by M. U. Jones and W. T. Jones* (London: English Heritage/British Museum Press, 1993)

-- 'The Textiles' in 'Anglo-Saxon Crafts' by Kevin Leahy, *The Oxford Handbook of Anglo-Saxon Archaeology*, eds. Helena Hamerow, David A. Hinton, and Sally Crawford (Oxford: Oxford University Press, 2011), 445-448

Handler, Richard, and Eric Gable, *The New History in an Old Museum: Creating the Past at Colonial Williamsburg* (Durham, North Carolina: Duke University Press, 1999)

Hansen, Egon H., *Opstadvæv før og nu*, Før og nu-serien, 1 (Copenhagen: Teamco, 1978)

Harrington, Sue, *Aspects of Gender Identity and Craft Production in the European Migration Period: Iron Weaving Beaters and Associated Textile Making Tools from England, Norway and Alamannia*, British Archaeological Reports International Series 1797 (Oxford: John and Erica Hedges Limited, 2008)

-- 'Soft Furnished Burial: an Assessment of the Role of Textiles in Early Anglo-Saxon Inhumations, with Particular Reference to East Kent', *Anglo-Saxon Studies in Archaeology and History*, 14, ed. by Sarah Semple and Howard Williams (Oxford: Oxford University School of Archaeology, 2007), 110-116

Harris, Anna and Marilys Guillemin, 'Developing Sensory Awareness in Qualitative Interviewing: a Portal into the Otherwise Unexplored', *Qualitative Health Research* 22.5 (2012), 689-99

Harvey, Nancy, *Tapestry Weaving: A Comprehensive Study Guide* (Loveland, Colorado: Interweave Press, 1991)

Haynes, A. E. ‘Twill Weaving on the Warp Weighted Loom’, *Textile History* 6 (1975), 156-64

Heath, John, ‘Women’s Work: Female Transmission of Mythical Narrative’, *Transactions of the American Philological Association* 141.1 (2011), 69-104

Hedges, John W., ‘Appendix 6: The Textiles and Textile Equipment’, in ‘Excavations at 1 Westgate Street, Gloucester, 1975’, ed. by C. M. Heighway, A. P. Garrod, and A.G. Vince, *Medieval Archaeology* 23 (1979), 159-213

Henderson, Isabel, ‘Sculpture North of the Forth after the Takeover by the Scots’, *Anglo-Saxon and Viking Age Sculpture and its Context: Papers from the Collingwood Symposium on Insular Sculpture from 800 to 1066*, BAR Series 49 (Oxford: British Archaeolgical Reports, 1978), 47-74

Henry, Philippa A., ‘Who Produced the Textiles? Changing Gender Roles in Late Saxon Textile Production: the Archaeological and Documentary Evidence’, *Northern Archaeological Textiles, NESAT VII, Textile Symposium in Edinburgh, 5th-7th May 1999*, ed. by Frances Prichard and John Peter Wild (Oxford: Oxbow Books, 2005), 51-57

Henshall, Audrey S., ‘Textiles on the Back of a Brooch from Blewburton Hill, Berks.’ from A. E. P. Collins and F. J. Collins, ‘Excavations on Blewburton hill, 1953’, Berkshire Archaeological Journal 57 (1959), 68-71

--, ‘Textiles and Weaving Appliances in Prehistoric Britain’, *Proceedings of the Prehistoric Society: New Series* 16 (1950), 130-162

Herlihy, David, *Opera Muliebria: Women and Work in Medieval Europe* (New York: McGraw-Hill Inc., 1990)

Hinton, David A., 'The Large Towns, 600-1300', *The Cambridge Urban History of Britain*, vol. 1, ed. D. M. Palliser, P. Clark and M. J. Daunton (Cambridge: University Press, 2000)

Hoffmann, Marta, *The Warp-Weighted Loom: Studies in the History and Technology of an Ancient Implement* (Oslo: Universitetsforlaget, 1964)

Holden, Eric William, 'A Saxon Weaving Hut', *Excavations at Old Erringham, Shorham, Part I* (Sussex: Sussex Archaeological Collections, 1976), pp. 306-322

Holdsworth, Phillip, 'Saxon Southampton: a Review', *Medieval Archaeology* 20 (1976), 26-61

Hooper, Luther, 'The Techniques of Greek and Roman Weaving', *The Burlington Magazine for Connoisseurs* 18.95 (1911), 276-284

Hunt, Stephen J., 'Acting the Part: "Living History" as a Serious Leisure Pursuit', *Leisure Studies* 23.4 (2004), 387-403

Hyer, Maren Clegg, and Gale R. Owen-Crocker, 'Woven Works: Making and Using Textiles', in *The Material Culture of Daily Living in the Anglo-Saxon World*, ed. by Maren Clegg Hyer and Gale R. Owen-Crocker (Exeter: University of Exeter Press, 2011), 157-184

Ingold, Tim, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill* (London: Routledge, 2000)

Jackson, D. A., D. W. Harding and J. N. L. Myres, 'The Iron Age and Anglo-Saxon Site at Upton, Northants', *The Antiquaries Journal 49.2* (1969), pp. 202-221

Janiskee, Robert L, 'Historic Houses and Special Events', *Annals of Tourism Research* 23 (1996), 398-414

Jennys, Susan, ‘The Great Buckskinner Debate’, *Harper’s Magazine* 286.1714 (1993), 23

Jewell, Helen, *Women in Medieval England* (Manchester: Manchester University Press, 1996)

Johnson, Muriel E., *The Saxon Warp Weighted Loom* (Sussex: The Open Air Museum, Singleton, Chichester, 1970s, no precise date)

Kirjavainen, Heini, ‘Local Cloth Production in Medieval Turku, Finland’, in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 93-96

Kissell, Mary Lois, *Yarn and Cloth Making: An Economic Study* (New York: The MacMillan Company, 1918)

Knudsen, Lise Ræder, ‘“Translating” Archaeological Textiles’, in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 103-111

Lamb, Jonathan, ‘Historical Re-enactment, Extremity, and Passion’, *The Eighteenth Century* 49.3 (2009), 239-250

Landt, George (Jorgen), *A Description of the Feroe [sic] Islands, Containing an Account of Their Situation, Climate, and Productions; Together with the Manners, and Customs, of the Inhabitants, Their Trade, &c.* (London: Longman, Hurst, Rees, and Orme, 1810)

Laws, K., ‘The Chalk’, in *Maiden Castle: Excavations and Field Survey 1985-6*, ed. by M. Sharples (Dorchester: Historic Buildings and Monuments, 1991), 210-214

-- 'The Worked Bone and Antler', in *Maiden Castle: Excavations and Field Survey 1985-6*, ed. by M. Sharples (Dorchester: Historic Buildings and Monuments, 1991), 234-241

Leahy, Kevin, *Anglo-Saxon Crafts* (Stroud: Tempus, 2003)

Liddell, Henry George, and Robert Scott, 'κερκίς', *A Greek-English Lexicon*, revised By Henry Stuart Jones (Oxford: Clarendon Press, 1940)

MacGregor, Arthur, *Bone Antler Ivory and Horn: the Technology of Skeletal Materials Since the Roman Period* (London: Barnes and Noble Books, 1985)

MacGregor, Arthur, and A. J. Mainman, 'Comb Making Evidence', *Craft, Industry and Everyday Life: Bone, Antler, Ivory and Horn from Anglo-Scandinavian and Medieval York*, The Archaeology of York: The Small Finds 17.12, ed. by A. MacGregor, A. J. Mainman and N. S. H. Rogers (York: Council for B. British Archaeology, 1999), 1917-1940

Magelssen, Scott, *Living History Museums: Undoing History Through Performance* (Lanham, Maryland: Scarecrow Press, 2007)

-- 'Making History in the Second Person: Post-Touristic Considerations for Living Historical Interpretation', *Theatre Journal* 58.2 (2006), 291-312

-- 'Performace Practices of [Living] Open-Air Museums (And a New Look at "Skansen" in American Living Museum Discourse)', *Theatre History Studies* 24 (2004), 125-149

-- 'Reenactment as Historiographic Operation at Plimoth Plantation', *Journal of Dramatic Theory and Criticism* 17.1 (2002), 107-126

-- ‘Resuscitating the Extinct: Backbreeding of Historic Animals at U.S. Living History Museums’, *TDR: The Drama Review: A Journal of Performance Studies* 47.4 (2003), 98-109

-- ‘Stepping Back in Time: The Construction of Different Temporal Spaces at Living History Museums in the United States’, *Theatre Annual: A Journal of Performance Studies* 57 (2004), 43-68

Martin, Rex, *Historical Explanation: Re-enactment and Practical Inference* (Ithaca: Cornell University Press, 1977)

McLean, Will, and Jeffery L. Singman, *Daily Life in Chaucer’s England* (Westport, Connecticut: Greenwood Press, 1995)

McLaughlin, Barbara K., ‘New Evidence on the Mechanics of Loom Weights’, *American Journal of Archaeology* 85.1 (1981), 79-81

Middleton, David, ‘The Reenactor’, *The Sewanee Review* 108.2 (2000), 184-185

Montelius, Oscar, *Civilisation of Sweden in Heathen Times*, trans. F. H. Woods (New York: MacMillan and Co., 1888)

Morton, A. D., *Excavations at Hamwic Vol. I: Excavations 1946-83, Excluding Six Dials and Melbourne Street* (London: Council for British Archaeology, 1992)

Mumford, Louise, Heather Prosser and Julie Taylor, ‘The Llangorse Textile: Approaches to Understanding an Early Medieval Masterpiece’, in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise Nosch (Oxford: Oxbow Books, 2007), 158-162

Munro, John Henry Alexander, ‘Technology and Technological Innovations in Medieval Cloth Making, to *c*. 1500,’ in *The Cambridge History of Western Textiles*, ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 191-200

Nielsen, Karen-Hanne Stærmose, *Kirkes Væv: Opstadvævens Historie og Nutidge Brug* (Lejre: Historisk-Arkæologisk Forsøgscenter Lejre, 1999)

-- ‘A Preliminary Classification of Shapes of Loomweights’, *Northern Archaeological Textiles: NESAT VII*, ed. by Frances Pritchard and John Peter Wild (Oxford: Oxbow Books, 2005), 129-135

Official Catalogue of the Great Exhibition of the Works of Industry of All Nations, 1851: Official Descriptive and Illustrated Catalogue, Part II, Classes V. to X., Machinery (London: W. Clowes & Sons, 1851)

Okasha, Elisabeth, *Hand-list of Anglo-Saxon Non-runic Inscriptions* (Cambridge: University Press, 1971)

Ólafsson, Ólafr, *Oeconomisk Reise igiennem de nordvestlige, nordlige g Kanter af Island* (Copenhagen: Gylendal, 1780)

Olavius, Olaus, *Oekonomische Reise durch Island in den Nordiveftlichen, und Nord-Nordiveftlichen Gegende* (Leipzig: Breitkopfischen Buchhandlung, 1787)

Ornstein, Michael, ‘Questionnaire Design’, *Current Sociology* 46 (1998), 7-47

Østergård, Else, *Woven into the Earth: Textiles from Norse Greenland* (Oxford: Aarhus University Press, 2004)

Outram, Alan K., ‘Introduction to Experimental Archaeology’, *World Archaeology* 40.1 (2008), 1-6

Owen-Crocker, Gale R., 'The "Bayeux Tapestry": Invisible Seams and Visible Boundaries', *Anglo-Saxon England* 31 (2002), 257-273

-- *Dress in Anglo-Saxon England: Revised and Enlarged Edition* (Woodbridge: Boydell Press, 2004)

-- 'Early Anglo-Saxon Dress: the Grave Goods and the Guesswork', *Textile History* 18.2 (1987), 147-157

Pasztokai-Seoke, Judit, 'Curry-Comb or Toothed Weft Beater? The Serrated Iron Tools from the Roman Province of Pannonia', *North European Symposium for Archaeological Textiles X*, ed. by Eva Andersson Strand, Margarita Gleba, Ulla Mannering, Cherine Munkholt and Maj Ringgaard (Oxford: Oxbow Books, 2009)

Peacock, Elizabeth E., 'The Contribution of Experimental Archaeology to the Research of Ancient Textiles', in *The Roman Textile Industry and its Influence: A Birthday Tribute to John Peter Wild*, ed. by Lise Bender Jørgensen, Antoinette Rast-Eicher, and Penelope Walton Rogers (Oxford: Oxbow Books, 2001), 181-189

Petty, Christina, 'Re-enactment', in *Encyclopaedia of Medieval Dress and Textiles*, ed. by Gale R. Owen-Crocker, Elizabeth Coatsworth, and Maria Hayward (Leiden and Boston: Konkinklijke Brill, 2012), 444-451

Pheifer, Joseph Donovan, ed., *Old English Glosses in the Épinal-Erfurt Glossary* (Oxford: Oxford University Press, 1974)

Philp, Brian, *The Discovery and Excavation of Anglo-Saxon Dover* (Dover: Kent Archaeological Rescue Unit, 2003)

Pinkerton, John, *A General Collection of the Best and Most Interesting Voyages and Travels in All Parts of the World* XII (London: Longman, Hurst, Rees and Orme, 1812)

Pirker, Eva Ulrike, ‘They Saw Our People Dressed Up and They Just … Escaped!: Mark Wallis in Interview About the Development of Professional Live History in Britain’, *Rethinking History: The Journal of Theory and Practice* 15.4 (2011), 551-565

Porter, John, *Anglo-Saxon Riddles* (Norfolk: Anglo-Saxon Books, 1995)

Poole, C., ‘The Small Objects of Daub and Clay’, in *Maiden Castle: Excavations and Field Survey 1985-6*, ed. by N. M. Sharples (Dorchester: Historic Buildings and Monuments, 1991), 209-210

Pritchard, Frances A., ‘Weaving Tablets from Roman London’, *Archäologische Textilfunde-Archaeological Textiles: Textilsymposium Neumünster 4.-7.5.1993*, NESAT V, ed. by G. Jaacks and K. Tidow (Neumünster: Textilmuseum Neumünster, 1994), 157-161

Rasmussen, Marianne, ed., *Iron Age Houses in Flames: Testing House Reconstructions at Lejre*, trans. by Anne Bloch Jørgensen and David Robinson (Leijre: Leijre Historical-Archaeological Experimental Centre, 2007)

Ray, Nina M., Gary McCain, Derick Davis and Tracy L. Melin, ‘Lewis and Clark and the Corps of Discovery: Re-enactment Tourism as Authentic Heritage Travel’, *Leisure Studies* 25.4 (2006), 437-454

Riddler, Ian, ‘Saxon Worked Bone’ *Pennyland and Hartigans: Two Iron Age and Saxon Sites in Milton Keynes* (Aylesbury: Buckinghamshire Archaeological Society, 1993), 107-119

Riddler, Ian, and Nicola Trzaska-Nartowski, ‘Chanting upon a Dunghill: Working Skeletal Materials’, in *The Material Culture of Daily Living in the Anglo-Saxon World*, ed. by Maren Clegg Hyer and Gale R. Owen-Crocker (Exeter: University of Exeter Press, 2011), 116-141

Riley, Judith, *Getting the Most From Your Data: a Handbook of Practical Ideas on How to Analyse Qualitative Data* (Bristol: Technical and Educational Services Ltd, 1990)

Roth, Henry Ling, *Ancient Egyptian and Greek Looms* (Halifax: Bankfield Museum, 1913)

-- *Studies in Primitive Looms: Complete in Four Parts* (Halifax: F. King & Sons, Ltd., 1918)

Rubin, Herbert J and Irene S Rubin, *Qualitative Interviewing: The Art of Hearing Data* (London: SAGE Publications Ltd, 1995)

'The Saga of the People of Laxardal', *Sagas of the Icelanders: A Selection*, ed. by Örnólfur Thorsson and Bernard Scudder, multiple trans. (New York: Penguin Books, 2000), 270-421

Sedgefield, Walter John, *An Anglo-Saxon Prose-Book* (Manchester: The University Press, 1928)

Schierer, Ingrid, 'Experiments with the Warp-Weighted Loom of Gars-Thunau, Austria', *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles*, ed. by Peter Bichler, Karina Grömer, Regina Hofmann-de Keijzer, Anton Kern and Hans Reschreiter, British Archaeological Reports International Series 1351 (Oxford: Archaeopress, 2005), 101-105

-- 'Experiments with Weaving and Weaving Tools: Basic Considerations After 20 Years of Work', *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles*, ed. by Peter Bichler, Karina Grömer, Regina Hofmann-de Keijzer, Anton Kern and Hans Reschreiter, British Archaeological Reports International Series 1351 (Oxford: Archaeopress, 2005), 97-100

Singman, Jeffrey L., and Will McLean, *Daily Life in Chaucer's England* (London: Greenwood Press, 1995)

Stolcova, Tereza Belanova, and Karina Gromer, 'Loom Weights, Spindles and Textiles – Textile Production in Central Europe from the Bronze to the Iron Age', *North European Symposium for Archaeological Textiles X*, ed. by Eva Andersson Strand, Margarita Gleba, Ulla Mannering, Cherine Munkholt and Maj Ringgaard (Oxford: Oxbow Books, 2009), 9-21

Strand, Eva Andersson, 'Experimental Textile Archaeology', *North European Symposium for Archaeological Textiles X*, ed. by Eva Andersson Strand, Margarita Gleba, Ulla Mannering, Cherine Munkholt and Maj Ringgaard (Oxford: Oxbow Books, 2009), 1-3

Strickland, Matthew, and Robert Hardy, *From Hastings to the Mary Rose: The Great Warbow* (Gloucester: Sutton Publishing Limited, 2005)

Stuart, John, *Sculptured Stones of Scotland* (Aberdeen: The Spalding Club, 1856)

Tivers, Jacqueline, 'Performing Heritage: The Use of Live "Actors" in Heritage Presentations', *Leisure Studies* 21 (2002), 187-200

Trinkl, Elisabeth, 'Artifacts Related to the Preparation of Wool and Textile Processing', in *Ancient Textiles,* ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 81-85

Wallace, Terry, 'Went the Day Well: Scripts, Glamour and Performance in War-Weekends', *International Journal of Heritage Studies* 13 (2007), 200-223

Walton Rogers, Penelope, 'The Anglo-Saxons and Vikings in Britain, AD 450-1050', in *The Cambridge History of Western Textiles, vol. 1,* ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 124-132

-- *Cloth and Clothing in Early Anglo-Saxon England AD 450-700* (York: Council for British Archaeology, 2007)

-- 'The Importance and Organization of Textile Production', *Rural Settlement, Lifestyles and Social Change in the Later First Millennium AD: Anglo-Saxon Flixborough in its Wider Context*, ed. by Christopher Loveluck, Excavations at Flixborough 4 (Oxford: Oxbow Books, 2007), 106-112

-- 'The Raw Materials of Textiles from Northern Germany and the Netherlands', in *Probleme der Ku'stenforschung im su'dlichen Nordseegeblet*, 1995), 389-400

-- 'The Re-Appearance of an Old Roman Loom in Medieval England', in *The Roman Textile Industry and its Influence*, ed. by Penelope Walton Rogers, Lise Bender Jørgensen and A. Rast-Eicher (Oxford: Oxbow Books, 2001), 158-171

-- 'The Significance of a Viking Woman's Burial in the Danelaw', in 'A Burial of a Viking Woman at Adwick-le-Street, South Yorkshire', ed. by G. Speed and Penelope Walton Rogers, *Medieval Archaeology* 48 (2004), 51-91

-- 'Stone Spindle Whorls', *Craft Industry and Everyday Life: Finds from Anglo-Scandinavian York*, The Archaeology of York 17.14, ed. by A. J. Mainman and N. S. H. Rogers (York: Council for British Archaeology, 2000), 2530-2533

-- 'The Sword-Beater', *The Anglian Helmet from 16-22 Coppergate*, The Archaeology of York: The Small Finds 17.8, ed. by D. Tweddle (York: Council for British Archaeology, 1992), 882-888

-- 'A Tangled Web', *Bulletin of York Archaeological Trust* 13.3 (1998), 32-37

-- 'Textile Making Equipment', *Craft, Industry and Everyday Life: Bone, Antler, Ivory and Horn from Anglo-Scandinavian and Medieval York*, The Archaeology of York: The Small Finds 17.12, ed. by A. MacGregor, A. J. Mainman and N. S. H. Rogers (York: Council for British Archaeology, 1999)

-- 'Textile Production', in *Life and Economy at Early Medieval Flixborough, c.600-1000; the Artefact Evidence*, ed. by D. H. Evans and Christopher Loveluck (Oxford: Oxbow Books, 2009), 281-316

-- *Textile Production at 16-22 Coppergate,* The Archaeology of York: The Small Finds 17.11, ed. by P. V. Addyman (Dorchester: Dorset Press, 1997), 1687-1784

-- 'Textile Production at Coppergate, York: Anglo-Saxon or Viking?', *Textiles in Northern Archaeology: NESAT III: Textile Symposium in York, 6-9 May 1987*, ed. by Penelope Walton and John Peter Wild (London: Archetype Publications, 1990), 61-72

Worsaae, Jens Jacob Asmussen, *Afbildniger fra Det Kongelige Museum for Nordiske Oldsager i Kjöbenhavn* (Copenhagen: Kittendorff and Aagaards, 1854)

West, Stanley E., *West Stow: The Anglo-Saxon Village 1: Text*, East Anglian Archaeology, 24 (Ipswich: Suffolk County Planning Department, 1985)

Whitelock, D., *Anglo-Saxon Wills*, ed. and trans. by D. Whitelock (New York: Cambridge/AMS Press Inc., 1930)

Wild, John Peter., 'Methodological Introduction', in *Ancient Textiles*, ed. by Carole Gillis and Marie-Louise B. Nosch (Oxford: Oxbow Books, 2007), 1-6

Wild, John Peter and Penelope Walton Rogers, 'Introduction', in *The Cambridge History of Western Textiles*, ed. by David Jenkins (Cambridge: Cambridge University Press, 2003), 9-29

Wilson, D., *The Archaeology of Anglo-Saxon England* (London: Methuen and Co. Ltd., 1976)

Wilson, D. M., and D. G. Hurst, 'Medieval Britain in 1964', *Medieval Archaeology* 9 (1965), 170-222

Youngs, Susan M., John Clark and T. B. Barry, 'Medieval Britain and Ireland in 1982', *Medieval Archaeology* 27 (1983), 161-229

Manuscripts

Cambridge, Corpus Christi College Library, MS 383, folio 68v

Cambridge, Trinity College Library, MS R.17.1, folio 263r

Utrecht, Universiteitsbibliotheek, MS Bibl. Rhenotraiectinae I Nr 32, folio 84r

Websites

The Association of Guilds of Weavers, Spinners and Dyers <http://www.wsd.org.uk> [accessed 7 Feb 2011]

'Gerefa', *Early English Laws* <http://www.earlyenglishlaws.ac.uk/laws/texts> [accessed 30 Apr 2013]

The Guild of Weavers, Spinners and Dyers <http://www.onlineguildwsd.org.uk> [accessed 4 Feb 2011]

Handweavers Guild of America <http://www.weavespindye.org> [accessed 1 Feb 2011]

Hispania Epigraphica <http://eda-bea.es> [accessed 5 Oct 2012]

Index of Christian Art <http://ica.princeton.edu/> [visited Princeton centre 1-5 May 2008]

Institute für Realienkunde <http://tethys.imareal.oeaw.ac.at/realonline> [accessed 11 May 2013]

Internet Archaeology < http://intarch.ac.uk/journal/issue5/westhes/3-6-2.htm > [accessed 7 March 2014]

The Knights Royal <http://www.knightsroyal.co.uk> [accessed 17 Oct 2012]

Linkedin <www.linkedin.com> [accessed 30 Oct 2012]

Njal's Saga, in *Icelandic Saga Database* <http://sagadb.org/brennu-njals_saga> [accessed 9 Mar 2012]

Norwegian Folk Museum <http://www.digitaltmuseum.no/things/vevstol-med-renning-og-kljstein-tegnet-av/NF/NF.06849-001> [accessed 8 Mar 2013]

-- 'Grenevev del 1 av 3 – Kautokeino 1955' <http://www.youtube.com/watch?v=XUm2JvsLzx8> [accessed 8 Mar 2013]

-- 'Grenevev del 2 av 3 – Olderdalen og Manndalen 1947' <http://www.youtube.com/watch?v=qxA1bpj6lB0> [accessed 2 Feb 2013]

-- 'Grenevev del 3 av 3 – Olderdalen og Manndalen 1947' <http://www.youtube.com/watch?v=6PD-FASC6ZQ> [accessed 2 Feb 2013]

-- 'Glimpt fra grenenveving – Manndalen, Troms 1955' <http://www.youtube.com/watch?NR=1&v=zXyaj16AmLg&feature=endscreen> [accessed 8 Mar 2013]

-- ‘Veving på oppstadvev’ <http://www.youtube.com/watch?v=VEcKR7ctIBg> [accessed 8 Mar 2013]

The Original Re-enactors’ Market < http://reenactorsmarket.co.uk > [accessed 17 Oct 2012]

Out on a Wing < http://www.outonawingfalconry.co.uk > [accessed 1 Nov 2010]

Oxford English Dictionary < www.oed.com> [accessed 10 Nov 2012]

Ravelry <www.Ravelry.com> [accessed 27 May 2012]

Regia Anglorum < http://www.regia.org > [accessed 17 Dec 2010]

-- *Chronicle* < http://www.regia.org/listings.htm#crafts > [accessed 16 Oct 2012]

-- *Wychurst* < http://www.wychurst.com > [accessed 30 Dec 2010]

Royal Commission on the Ancient and Historical Monuments of Scotland < http://canmore.rcahms.gov.uk/en/details/1199915/> [accessed 5 May 2013]

Society for Creative Anachronism < http://www.sca.org/ca/issues.html > [accessed 9 Oct 2012]

-- <http://www.sca.org/docs/index.html > [accessed 12 Nov 2012]

-- < http://www.sca.org/officers/chatelain/sca-intro.html > [accessed 12 Dec 2010]

The Telegraph < http://www.telegraph.co.uk/news/uknews/1530944/Long-road-to-Hastings-as-Saxons-march-to-battle.html > [accessed 4 Oct 2012]

The Vikings! < http://www.vikingsonline.org.uk > [accessed 15 Dec 2010]

-- *The Runestaff* < http://www.vikingsonline.org.uk/resources/articles.htm > [accessed 1 Oct 2012]

The Vikings – North America: Ravensborg < http://www.ravensborg.org > [accessed 14 Oct 2012]

-- *The Vineland Vine* < http://www.ravensborg.org > [accessed 14 Oct 2012]

Warp Weighted Weavers Group <http://groups.yahoo.com/group/WWLoom> [accessed 27 May 2012]

Warp Weighted Weavers Questionnaire <http://warpweightedweaversquestionnaire.blogspot.co.uk> [accessed 1 Jan 2013]

Wolf's Head Bowmen < http://www.wolfshead-bowmen.com > [accessed 17 Oct 2012]