

HIST 4990 6.0

## History of Technology – Independent Reading Course

**Capstone Essay (15-20 pages): 50%**

You must make use of a minimum of one substantial historical primary source document for this assignment. The paper should address one or more of the **major themes** we have discussed over the course of the first semester and should engage with the existing historiographical and theoretical work relevant to that theme.

Your paper must make an argument, relying for support upon additional secondary source research. The purpose of this assignment is to show your competence in the following areas: analysis of primary sources; ability to comprehend, analyze and think critically about course issues and themes, relating these issues and themes to your primary source(s); forming and defending an argument; writing (content, structure and style).

You are expected to submit one (or more) drafts, and incorporate the suggested revisions into the final assignment.

**Misjöfn Verks;  
gendered division of labour and social/instrumental power in the viking age**

"Misjöfn verða morgunverkin. Eg hefi spunnið tólf alna  
garn en þú hefir vegið Kjartan."

“Various are morning works. I have spun twelve ells of  
warp and you have slain Kjartan.”

-Laxdaela saga, Ch 49.

The word “technology” can be defined in a number of different ways, and can be applied to everything from the cognitive machinery which allows humans to interact with tools, to the tools themselves, and even to the objects created by using tools.<sup>1</sup> Which definition is used categorically shifts the discussion and affects where boundaries are drawn between behavior, symbol, and material culture. Ultimately, the word represents a modern category that should not be expected to function straightforwardly in the Scandinavia of 1000 years ago, but identifying historic categories and the boundaries that divided them is difficult. What Gudrun meant when she declared morning works “misjöfn” is somewhat confusing... She is using some kind of categoric difference between her husband’s sword work and her own spindle craft to make some salient point, but what are the categories, and what is the point? In this paper, I argue that one of the key categories Gudrun is relying on is encompasses women, mechanism, and the ability to

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<sup>1</sup> Schiffer, 2001, p3

carry out work at a degree of remove. Mechanisms, within the broader category of “technologies,” have the unique ability to transmit and multiply force and to automate labour. I argue that Gudrun is claiming responsibility for Kjartan’s death through the social mechanism of *whetting*, using the rotating drop spindle as an instrumental analogy, a symbol of feminine mastery over mechanistic knowledge and indirect action.

## Economics

Three old Norse revenge poems are convenient for comparing the genderedness of technological assemblages in the Viking age, *Gróttasöngur*, which describes a grain mill worked by women; *Darratharhlod*, which describes a loom also worked by women; and *Völundarkviða*, which centers on a smithy worked by a man. These examples seem to suggest that through their use of technology, women in the Viking age were seen to exert some kind of power, including magical control over men. Setting aside the magic, this appears to be a literary reflection of an underlying truth. Women’s work was of major economic importance in Viking age households. Nordic household economies participated in an extensive world system which relied on long-distance trade and was steeped in complex international politics.<sup>2</sup> Technologies of production shaped daily life in households just as powerfully as they shape modern business, the difference is that home and business were not, for the most part, separate spaces. Households usually included the householders’ immediate family and an array of dependents, and they functioned as an economic unit. In the Icelandic sagas, young men of the *bondi* (householder)

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<sup>2</sup> Sindbæk, Søren Michael. “The Small World of the Vikings: Networks in Early Medieval Communication and Exchange.” *Norwegian Archaeological Review* 40, no. 1 (June 2007): 59.

class often went abroad to make their names and fortunes, after which they would return to Iceland to marry and run a household based on farming, ranching, and fishing.<sup>3</sup> Although raiding did happen, young Icelanders typically planned to trade for their fortune,<sup>4</sup> carrying cargoes of woolen trade-cloth manufactured by the women of their households using a machine called the Warp Weighted Loom. This cloth, called *Vadmal*, was a woolen twill comparable in many ways to denham.<sup>5</sup> It was also a strictly regulated commodity cloth which functioned as a currency. The word “Snuðr” (to spin) also meant “profit” in Old Norse, which may be a reference to the transformation of raw wool into Vadmal as a process of literally *making* money.<sup>6</sup>

Ground grain, on the other hand, was not a trade commodity. Grain was likely stored as whole kernels and making flour, meal, or cracked grain was likely a daily task. Ground or cracked grain was a necessity for feast foods like beer and bread, which formed the focal point of political life, and was also part of daily foodways. *Graut* (porridge) was a daily staple needed to fuel grueling physical labour, including maritime expeditions.<sup>7</sup> While the importance of weaving is somewhat exaggerated in Iceland because cloth was the major export, clothing, tentage, bedding, sailcloth, the feeding of large households through long winters, and the provisioning of fishing and trading expeditions in the summers were important across Scandinavia. If women

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<sup>3</sup> This is a common theme in major sagas such as *Laxdaela*, *Egils*, and even *Jomsvikinga* saga,

<sup>4</sup> The comedic *Sneglu-Halla* Thattr makes a mockery of the trope, taking as its lead a man who is incapable of either raiding or trading, and instead makes his fortunes on snark alone. This approach is outside the scope of this paper, as Halli was able to insult people without mechanical aids.

<sup>5</sup> Although made of wool not cotton, Vadmal shares a weave structure and utility characteristics with Denham, as well as a wide range of quality within a closely regulated type. It may be reasonable to guess that Nordic people were as sensitive to fine distinctions between vadmal from different producers as we are to the quality of jeans. Such sensitivity may explain the significance of patterned twill weaves found in burial clothing. Even the colour was often the same, as Viking age dyers regularly used woad, which contains the same dye chemical as the Indigo used for Denham.

<sup>6</sup> Cleasby Vigfusson

<sup>7</sup> *Eyrbyggja* saga ch 39, *Floamanna* saga ch 26. In *Gisli* saga, Thordis makes a point of serving a man porridge before picking up his sword and attempting to kill him. Porridge could also have ritual value; In *Eirik the Red's* Saga, the Seeress (*Volva*) is given a special meal including the hearts of all the local animals and goat's milk porridge. *Sneglu-halla* thattr's central joke turns on Porridge.

did not produce sufficient supplies, trade and feasting traditions that were key in the masculine sphere were undermined.<sup>8</sup> That these feminine-coded works relied on more complex mechanisms than most male-identified work may have created a sense of mechanical knowledge as female-identified, maybe even somewhat frightening or inaccessible to men.

## Technology

Even a cursory look at Viking Age craft practice reveals looms as some of the most mechanically complex technologies in use (fig 1). Looms included variants meant for soumac, a cross between weaving and embroidery; sprang, a stretchy, braided fabric; tablet weaving a fascinatingly strong form of narrow works; and the iconic warp-weighted loom for producing bulk cloth. The warp-weighted loom is ancient and very widespread, but some of the finest woolens ever produced with it were made in Viking Age Scandinavia.<sup>9</sup> Nordic textiles went through an experimental phase just before the viking age, and settled into a period of virtuosity that lasted as long as the distinctive viking age dress custom did.<sup>10</sup> Textile historian Ben Cartwright argues that the changes in textile production had wide-ranging effects on lifestyles.<sup>11</sup> The transition to horizontal looms allowed much weaker threads to be used to make cloth, and complex weave structures gave way to fabrics which were finished with felting that obscured, and therefore de-emphasized the weave structure.<sup>12</sup>

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<sup>8</sup> Carstens 2014, 16

<sup>9</sup> Hoffman, Marta, *The Warp Weighted Loom*: 5.

<sup>10</sup> Hoffman, 15

<sup>11</sup> Cartwright, 2014, 161.

<sup>12</sup> Hoffman, 268

The warp-weighted loom relies on gravity to stretch the warp (lengthwise threads) and a series heddles made from looped and knotted cord. These heddles are used to create two or more sheds -- pathways for the weft (crosswise) thread to travel through. As one shed is closed and another opened, the warp threads cross, binding the weft into place. By manipulating the heddle rods, the weaver progresses through a regular sequence of sheds, passing the weft across the loom each time and building up a length of cloth towards the top of the loom. When enough cloth has been made, the cloth board to which the top threads are attached is rotated, winding the finished work up and out of the way, and the weights are moved down the warps so that they continue to hang near floor level and fresh thread is available for weaving. The knots needed to hang the weights and to “knit” the heddles<sup>13</sup> form a key element of the technology. The flexibility of these fiber-based machine parts makes the loom very flexible, it is relatively easy to change the loom width or add complexity (inserted pile, tapestry elements, pattern reversals). The number of heddle rods can be changed, and manual picks are relatively easy to make compared to later styles of loom. In some extant textiles, the selvages (side edges) are tubular or tablet-woven, presenting possibilities for both functional and decorative detailing.

While modern denham is a simple twill, weaves from the viking age often feature alternations and reversals, for example the fairly common herringbone twills require alternation in the binding pattern of the warp. These pattern elements are ‘programmed in’ during the heddle knitting process and create an effect much like chevrons pointing up and down the cloth. For broken lozenge twill, a high-quality patterned weave found mainly in viking age women’s clothing, the order in which the weaver picks the sheds also reverses regularly, forming a

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<sup>13</sup> Knitting was not known in the Viking Age, this is a modern term, and slightly misleading in terms of structure.

diamond effect. These patterned weaves show that the weaving process itself was respected, as the relatively subtle visual effect requires expertise and attention to produce, but does not require substantially more time or better materials. These fabrics are a demonstration of virtuosity and mastery over the technology. Examples from Birka, Oseberg, and Lousgaard have as many as 60 threads per centimeter in the warp,<sup>14</sup> substantially finer than later examples.<sup>15</sup> These very fine fabrics depend on the knit heddles, as later styles of heddle wear out such closely spaced warp threads.<sup>16</sup>

The warp-weighted loom is also unforgiving of poor materials. Poor warp threads break frequently under the tension from the weights and jostling from the beater. Slow adoption of spinning wheels in Scandinavia may have been related, as wheels produce threads which cannot be used as warps on a warp weighted loom. In the same way that Blacksmithing implies iron smelting, use of the warp weighted loom implies the use of drop spindles. The apparent simplicity of the drop spindle compared to the spinning wheel -- including the reduced mechanical complexity -- does not correspond to lower quality outputs. Wheels may be faster, but they represent industrialization and deskilling more than technological progress. In Iceland, where the economy was especially dependent on the export of high-quality cloth drop spindles continue to be used well into the medieval period.<sup>17</sup>

This reversal of the expectation that technological advancement and the intensification of production means larger more centralized sites is consistent across many technologies in the Viking age.<sup>18</sup> Before 600, large, slag pit furnaces were the main smelting technique;<sup>19</sup> and the

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<sup>14</sup> Hoffman, 241

<sup>15</sup> Hoffman, 249

<sup>16</sup> Hoffman: 248

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<sup>18</sup> Tveiten and Loftsgarden, 2017. p115,

first known blast furnace appears in Sweden, possibly as early as 1150 AD,<sup>20</sup> but during the viking age itself, bloomery iron was produced within households, in smaller furnaces closer to the raw materials.<sup>21</sup> Iron working follows a similar pattern, with itinerant smiths prior to the viking age becoming household smiths (like Volundr) during the viking age.<sup>22</sup> Before the viking age, large hand cranked grain mills were found mainly at temple sites, and after the viking age water-mills again centralized grinding and located it outside the home, but during the viking age small hand mills were a household appliance (fig 2).<sup>23</sup>

Blacksmithing is a classic example of a complex technology. Smithing requires a well-tuned sense of temperature, timing, and the behavior of semi-fluids. Smithing implies smelting, with the complex of chemical, thermodynamic, and fluid dynamic knowledge required to achieve a functional bloom.<sup>24</sup> Both require a familiarity with air-accelerated fires and modified fuels like charcoal and coke. Despite the very real complexity of the technology, however, strikingly little in a viking age iron working is *mechanically* complex. The trip hammer was a post-viking age development. Iconographic evidence of smithing emphasizes the bellows, which is a good candidate for the ironworker's most mechanically complex tool. It is likely to have a more complex hinge than any of the tongs, and the flap used to block the vent is automated -- opening and closing by the pressure of the air being pumped. It would be fair to suggest that it rivals the drop spindle in mechanical complexity. Even so, it relies on reciprocal

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<sup>19</sup> Tveiten and Loftsgarden, 2017. "The Extensive Iron Production in Norway in the tenth to the thirteenth century" in *Viking Age Transformations*. p113

<sup>20</sup> Robert B. Gordon and Terry S. Reynolds, "Medieval Iron in Society-Norberg, Sweden, May 6-10, 1985," *Technology and Culture* 27, no. 1 (1986): 110–17/

<sup>21</sup> Tveiten and Loftsgarden, 2017, p113.

<sup>22</sup> Carstens, 2014, 22

<sup>23</sup> Baug, 2015, 34

<sup>24</sup> While viking age smelters likely would not have discussed carbon content in modern terms, the distinction is a matter of language and terminology, not one of understanding.



motion, the force generated is generated by the strength of the operator rather than the mechanism, and it does not produce a continuous output. This distinction between mechanical complexity and the more general category of technological complexity is easy to overlook.

Querns became a trade item during the period, and took on increasingly standardized forms.<sup>25</sup> Like spinning, grinding was part of the daily routine of women's household management and was involved in both brewing and cooking. Viking age querns have single handles, so they would have allowed one person to generate significant torque, and it's not impossible that some querns used complex drive mechanisms.<sup>26</sup> Querns are technologically fairly simple -- they just crush things. Mechanically, however, they leverage a number of mechanical tricks in order to produce a continuous, homogenous output. Unlike simple grindstones or saddle querns, which rely on reciprocal motion, in a rotary quern, a continuous feed of unground grain is predictably reduced to flour or meal and automatically directed into a waiting receptacle.<sup>27</sup> The weight of the grindstone does the work of crushing the grain, gravity and centrifugal force both play a role in moving it through the mechanism, and consistency is assured by mechanically setting the gap between the two stones.

## Rotation

Rotation may seem to be an unlikely marker to hang the idea of "mechanism" on, but it is salient not because of explicit or conscious coding, but because of its relationship to tacit

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<sup>26</sup> Åsa Dahlin Hauken and Timothy J Anderson, "Collection Report: Rotary Querns in the Museum of Archaeology University of Stavanger," n.d., 161. p48

<sup>27</sup> Åsa Dahlin Hauken and Timothy J Anderson, "Collection Report: Rotary Querns in the Museum of Archaeology University of Stavanger," n.d., 161. p47

knowledges. It is difficult to “think” rotation if you’re not used to it. That isn’t to say that conscious social coding doesn’t also exist, but that social coding is a symptom not a cause, and therefore doesn’t have to be strongly marked to be indicative. According to Schiffer, this cognitive component of technology is under theorized “because it is so thoroughly and deeply embedded in practice and because much of it consists of visual and kinesthetic ‘images’ that cannot be verbalized readily or at all.”<sup>28</sup>

Rotation may be a key feature linking technologies and defining a category of mechanisms which was coded feminine in the viking age. In The Saga of Burnt Njall, Gunnar asks Halgerdr, his wife, to cut two locks of her own hair to repair his bow, specifically suggesting that she and his mother should work together to twist (snúið) her hair into a new string. When Halgerdr refuses, Gunnar is slain. In this passage, Gunnar’s dependence on his wife is absolute, and involves both her body and her skill... as a grown man, he still needs his mother’s help to maintain his weapon.<sup>29</sup>

The distinction between rotary and linear motion is often significant in technological contexts, in part because in many situations rotation, or the transformation between linear and rotational motion<sup>30</sup> is the key to continuous output. In general, machines which rely on rotation have greater complexity than those which do not, and even spindles, however simple they appear, are complex machines. Unlike simple machines like oars, hammers, sails, and saws, spindles perform multiple actions simultaneously, and it is the energy stored in the machine, not the muscle power of the worker, which does the work, as in the case of the rotary quern. While

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<sup>28</sup> Schiffer, 2001, 5

<sup>29</sup> Brennu Njals saga, ch 77

<sup>30</sup> As may have been done to turn querns

looms do not use rotation as the main mechanism, it is the rotating fabric board which allows for the production of yardage -- continuous bulk cloth.

While a bowstring can be made without any mechanism because of its limited length, most textile technologies rely on continuous production. The drop spindle is a deceptively simple tool. The work is done largely by the mechanism, with the spinner regulating the speed at which the raw material is fed, and stopping the twisting from travelling too far up the unfinished thread. It is the weight which draws out the fiber, and the flywheel effect which actually spins the thread. The spindle rotates freely, allowing for a theoretically infinite number of twists, and an theoretically infinite length of continuous thread, though the work is stored on the spindle shaft (snælduhali) and practically speaking, there will come a point when it is more convenient to finish the thread.

The idea of spinning yarn is associated with Magic in many cultures including Viking Age Scandinavia,<sup>31</sup> but spinning is magical not just in terms of myth and symbol; it has a more mundane magic in the form of embodied learning. A drop spindle only works if you handle it in certain ways; the spinner does not choose how the physics works, she only chooses between a few possible paradigms for applying it. Even that level of choice may be an exaggeration, as the specific methods are often determined mainly by the type of material being spun, and cultural inheritance transmitted to new spinners at a very young age and often with ideological overtones.

<sup>32</sup> As textile scholar Lise Bender Jørgensen puts it “it takes practice to spin evenly and efficiently, but once learnt it becomes second nature -- a simple, subconscious movement, almost a slight-of hand.”<sup>33</sup>

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<sup>31</sup> Cartwright 2014, 162.

<sup>32</sup> Jørgensen, 2013. p 129.

<sup>33</sup> Jørgensen, Lise Bender. (2013) “Spinning faith” in *Embodied Knowledge*. p128.

In daily life, it is necessary to take the skills and knowledge that we have most thoroughly assimilated for granted... otherwise we'd be so fascinated by our own abilities we'd be paralysed. It can be hard to explain embodied knowledge to others, and easy to doubt the reliability of tacit knowledge that we do not possess, precisely because these ways of knowing mostly lurk below the level of consciousness, and outside the realm of speech.

## Embodied Knowledge

Practice trains and alters the body, modifying brains and musculature, and over time even permanent modifications to the skeleton can develop. Deeply embodied knowledge is inherently part of history, and is especially important in understanding the history of daily life... but it can look and feel like magic. "Skill is not simply a property of a body but applies to a dynamic system in which a body actively engages its surroundings. Skill is thus mental, physical, and psychological, and encompasses the total field of relations constituted by the presence of organism person, indissolubly body and mind, a richly structured environment."<sup>34</sup> Representation and expectation also play into gender coding and the process of learning gendered tasks. Cockburn and Ormrod report that we are often "ready to blame" when a person makes an error

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<sup>34</sup> Schiffer, 2001, 4

doing something unexpected, but ready to forgive when a person makes the same error during a task we expect to see carried out by someone categorically “like” them.<sup>35</sup>

The present day association between gender and technology is so persistent partly because both practise and expectation begin to affect humans almost from birth, and practice -- in the form of play -- is gendered almost immediately both by adult encouragement,<sup>36</sup> and through the efforts of the child to establish a gendered identity.<sup>37</sup> Late Iron age nordic culture has been described as “strongly gendered” based on Saga evidence, and well furnished burials.<sup>38</sup> Despite some methodological concerns, it seems clear that there was a strongly gendered division of labour,<sup>39</sup> and that children’s ability to conform to gendered expectations was evaluated beginning at an early age.<sup>40</sup>

It is therefore reasonable to expect similar or even stronger association between specific skillsets and gender in the Viking Age than in the present. A link between mechanisms and women may have existed, not because the gender coding of kitchens and home textile production was different, but *because it was the same*, and kitchens and weaving houses were the places where complex machines were to be found.

Schafer notes that it is important to pay attention to “The profound meanings that inhere in technological activities themselves.”<sup>41</sup> That is to say, we need to pay attention to the

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<sup>35</sup> Cockburn, Cynthia, and Susan Ormrod. *Gender and Technology in the Making*. SAGE Publications, 1993. 1

<sup>36</sup> Marilyn Stern and Katherine Hildebrandt Karraker, “Sex Stereotyping of Infants: A Review of Gender Labeling Studies,” *Sex Roles* 20, no. 9–10 (May 1989): 501–22, <https://doi.org/10.1007/BF00288198>. 519

<sup>37</sup> Ibid 518.

<sup>38</sup> though in fact a majority of burriels cannot be gendered based on grave goods but only those with “enough” goods to analyse are included in the studies.

<sup>39</sup> See Kupiek and Milek 2014, 115, Lokasenna

<sup>40</sup> See the descriptions of young Halgerdr (Njalls saga ch1) Egil Skallagrimmson (Egilsaga) and Varg (Jomsvikinga saga) for examples of introductions which stereotypically include gendered comments about children.

<sup>41</sup> Schaffer, 2001, 7

symbolism not just in objects, but in the act of creating objects. When we encounter complex mechanisms in viking age literature, we rarely find the 1950's stereotype of a wife nagging her husband to fix the washing machine. Instead we find women who possess exclusive knowledge and competencies involving mechanisms, and men who seem to depend on women to handle the technology on their behalf. This applies to complex female-identified mechanical technologies like the quern in *Gróttasöngur*, but it also appears with technologies that seem simpler and more masculine-identified. As in the story of Gunnar's death, this dependence can be both direct and symbolic.

Embodied learning is a factor not just in threadmaking, but also in the handling of querns and looms -- and smithies. What links the feminine technologies both in the material world and in the symbolic world of the sagas is the continuous outputs, automaticity and rotation.

Masculine technologies relied on knowing how to hold a sail against the wind, push the water with an oar, feeding and training a living animal, applying the force of a hammer or sword to a target. Women's technologies relied on setting up mechanisms to automatically produce desired outputs. On one day, the quern might need to be configured to make cracked grain suitable for beer, and on another day fine flour suitable for feast bread. Making enough thread to clothe and shelter a household required choosing a spindle whorl suitable for hard warp threads, and also a different one which will make good wefts. Making cloth suitable for an array of uses meant knitting the heddles and weighting the warp so as to produce a woolen twill one day, and a linen tabby the next.

In *Gróttasöngur*, two types of knowing are contrasted. The King is called *Frodi*. The name means 'wise,' but with connotations derived from its older meaning of virility. The

giantesses, on the other hand, are described as having *framvisar* or foresight.<sup>42</sup> While foresight is not an exclusively feminine form of wisdom in viking culture, it is frequently associated with women in the form of prophetesses (*Volvur*), including in *Völuspá*, another eddic poem. In *Njals saga*, Njal (who is male) is said to have the power of foresight, however there is a feminine twist, Njall is also known as “Old beardless.” *Seiðr*, another feminine kind of wisdom, is described as a form of magic. Elder Heidi has argued that the term means “to spin,” and that it can be recognized not only in Old Norse, but in other germanic languages and even in Sámi, a Finno-Ugric language used by the indigenous population of Finland.<sup>43</sup>

By producing effects that only become apparent later, some of these mechanisms may have created the impression of magical effect at a distance. Combined with the real economic importance of women’s work to male power and subsistence, this magic may have seemed somewhat ominous, producing the idea that women could seem to be doing one thing while their focus was really on accomplishing something else entirely. While the idea of the fates spinning men’s destinies is not unique to Viking age culture, it may have been intensified there by the focus on tightly integrated family economies, and the instrumental value of women’s contributions.

## The poems

*Volundarkvitha* and *Gróttasöngur* are both found in the poetic edda, while *Darradarljod* is preserved as part of *Njals saga*. The first two focus on rotation, and the third never mentions it. Two imply that the use of the technology produces magical action at a distance in addition to any

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<sup>42</sup> Tolley 2008, 3

<sup>43</sup>

immediate product, and in the third, revenge must be accomplished through direct application of tools to killing and modification of remains. Of the three it is the two female-coded tools which use rotation that are magical.

In Gróttasöngr the women are the giantesses Fenja and Menja who made the stones, and have now been enslaved by King Frodi for the purpose of grinding out wealth. The origins of the weavers in Darradarljod are less clear. Both Gróttasöngr and Darratharljod are among the clearest examples of work songs from the period, and the songs seem to be implicated in the magical effects, mirroring the role of poetry in the whetting woman motif. Through their worksongs and the machines, the women determine the course of far off violence. “Let’s Grind: Yrsa’s son shall Halfdan’s murder avenge on Frodi” the Giantesses chant, while the weavers use a similar formula, “wind, wind... let us not permit his life to be lost.” Volundarkvitha is a convenient contrast, presenting us with an enslaved man forced to forge valuable objects. While Volund takes revenge on his master, just as Menja and Fenja do, his tools do not magically direct the weapons of others, he must commit his own killings by hand. For this analysis, the details of the magic are not crucial. What is interesting is the strong association between women, machines, and magic.

Lise Bender Jorgensen has also argued that the idea of rotation was symbolically important to Nordic peoples at the time, mainly based on other sources, but she notes that the magical effect of the loom in *Darraðarljóð* seems connected to the rotation of the fabric board. Looking at somewhat earlier Nordic textiles, she notes that spin directions in finished textiles may have had a gendered significance at that time, which is notable because it is nearly universal



in other cultures that all threads are spun in a consistent direction.<sup>44</sup> Michelle Hayeur-Smith has argued a similar point based on the frequency of motifs referencing rotation in art, in particular the art which appears on women's jewelry.<sup>45</sup> Gudrun's "misjöfn verks" comment is often explained as a comparison of quality or amount of work done, but 12 ells of thread is a tiny amount -- an experienced spinner could make 12 ells in one or two minutes -- so it is difficult to imagine what point she is trying to make if these are the categories she intends.

As work songs and poetry seem to take each other's places in whetting and mechanical magic, finished cloth is a consistent element in the "whetting woman" motif in the sagas perhaps taking the place of the machine. Women who wish to incite men to kill generally do so by telling them to do it in the form of poetry spoken over the bloody clothes saved from the person they want avenged. In *Laxdaela* saga, when Helgi Hardbienson wipes Bolli's blood from his spear onto Gudrun's cloak, Halldor is alarmed, thinking Helgi has acted gruesomely. Gudrun, however, smiles, and Helgi indicates that he knows he is providing her with the currency to demand his own death saying that "under this scarf end lies my death."<sup>46</sup>

In common with *Grottisongr*, *Darradarljod* contains some hard-to-translate archaic or technical terms. In particular *darraðr* itself. This is not entirely surprising, since technical terms are often idiosyncratic and difficult to explain even between native speakers of the same language. Saga scholar R. G. Poole notes that "Darradar" is listed in a *Thula* (Mnemonic list)<sup>47</sup> along with "nails" and "rivets," but since the word seems elsewhere to refer to either a banner or a banner stand, he finds it out of place in the same category as these fastenings (Poole 1991,

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<sup>44</sup> Jorgensen, 2013,

<sup>45</sup> Smith, *Draupnir's Sweat and Mardoll's Tears*

<sup>46</sup> *Laxdaela* Saga, ch 55.

<sup>47</sup> AM 748 II

126). If the term refers to the fastening by which cloth and shaft are joined, however, all three meanings might be reconciled. It is technically simple to use a banner standard in the loom itself, by putting it in the place of a regular fabric board and preparing the warp directly on the banner stand. The banner cloth could then be woven directly onto the standard, in which case, the banner, the fastening, and the standard are all being turned as the fabric is drawn up. This is another example of the flexibility of the technology. Regardless of the exact meaning of the word “Darraðar,” both poems emphasize the rotating part of the technological system. In Darraðarljóð, the long process of creating the warp, and attaching it to the beam is left out, as is the process of knitting heddles. The loom is ready to go when the poem begins. In Gróttasöngur, it is emphasized that only the women can set up the mill, but the magic happens when they grind, “Songu ok slungu snudga-steinini” the poem reports “they sung and they slung the whorlstone.”<sup>48</sup>

## Discussion

Faced with fragmentary information about the past, there is a tendency to project modern categories backwards to fill the gaps, usually also simplifying them in the process. It is easy to imagine that a thousand years ago gender, gender roles, division of labour by gender category, and so on were simpler problems. Recent work on Nordic cultures of the Viking Age<sup>49</sup> challenges these assumptions both in terms of complexity, and in terms of specific gender roles. Neil Price and the team who worked on the DNA analysis of BJ 851, a Swedish “warrior grave”

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<sup>48</sup>

<sup>49</sup> c. 650-1150 While it is clear that there was a distinctive and recognizable Nordic culture across the Scandinavia at this time, there was also a lot of variation. Around 600, Scandinavia is a living tapestry of small kingdoms with distinct identities. By 1100, all of Scandinavia has converted to Christianity and had resolved itself into large state-like political structures.

now proven to contain a woman's skeleton caution us strongly that "we must question our assumptions and categories."<sup>50</sup> As it becomes increasingly clear that nordic women were powerful within the home,<sup>51</sup> in ritual contexts,<sup>52</sup> and as BJ 851 suggests, sometimes even in combat, it also becomes important to examine the sources and mechanisms of that power. Rather than assuming that technology, especially the mechanical arts, were coded masculine in Viking Age Scandinavia simply because they are now, it's important to look carefully at the literature and material culture.

Looms and querns occur in the archaeological record in overwhelmingly female contexts.

<sup>53</sup> Viking age poetry about machines suggests that using and maintaining them was the domain of women. Economics suggest that everyone, including men, were heavily dependent on women's work in the family economy of late Iron Age and Early Medieval Scandinavia. While reliance on a labour force does not universally denote respect for the individuals involved, the Old Norse language contains some clues that people were conscious of the value of women's work; the noun *snuðr*, "a twist" can refer to the whorl of a spindle -- but can also mean "profit."<sup>54</sup> Notably, the single richest burial known from Viking Age Scandinavia is that of "The Oseberg Queen," who was buried with an array of looms, a quern, and other equipment as well as a large, ornate ship, sleighs, and a fascinating modular cart.<sup>55</sup>

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<sup>50</sup> Neil Price et al., "Viking Warrior Women? Reassessing Birka Chamber Grave Bj.581," *Antiquity* 93, no. 367 (February 2019): 181–98, <https://doi.org/10.15184/aqy.2018.258>. P194

<sup>51</sup>

<sup>52</sup>

<sup>53</sup> Soumak is something between weaving and embroidery, sprang is something between weaving and braiding, and in the context of these others it becomes notable that even tablet weaving is a cross between twined cordage and weaving.

<sup>54</sup> Cleasby-Vigfusson p576

<sup>55</sup> Sjøvold, p 33

Regardless of the power dynamics between women and men, the separation of masculine and feminine knowledge spheres has the potential to produce ingrained stereotypes that certain kinds of knowledge are native to women and not to men. In the viking age mechanical technologies, those tools which performed multiple functions, required extensive set-up, produced continuous outputs, and relied on rotary motion may have formed a category which was associated with the feminine sphere and female knowledge. This category may have had magical overtones because of the potential for mechanisms to automate and to transmit power, this potential may also have been associated with the social tradition of whetting, a kind of mechanistic use of social power where men, through their social linkages, could be incited to perform specific actions on the behalf of their female kin. In short, if we are looking for a mechanic in the viking age, we should probably consider looking for someone wearing brooches and skirts and wielding a distaff.

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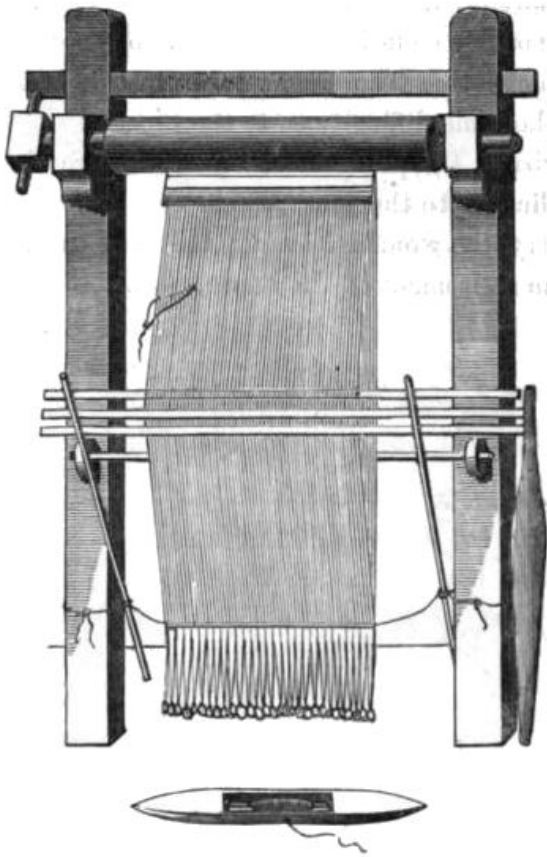


Figure 1: By Alfred Barlow - Digitized by Google, Public Domain,

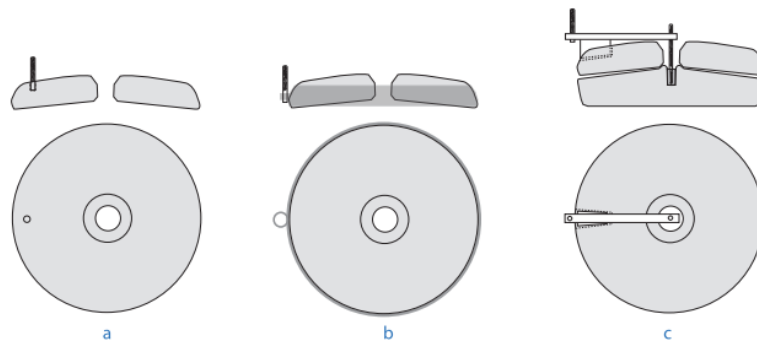


Fig. 32: Schematic representation of the rotary handmill driving fittings. a) vertical handle socket, b) "strap" type handle, c) radial slot handle.

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Figure 2: Quern (Image from Åsa Dahlin Hauken and Timothy J Anderson, "Collection Report: Rotary Querns in the Museum of Archaeology University of Stavanger," n.d., 161.)

