

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.

4990 Final Draft
For Dr. Schotte
By V. M. Roberts

**Misjöfn Verks;
Social and 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
thread 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 that allows humans to interact with tools, to the tools themselves, and even to the objects created by using tools.¹ The choice of definition categorically shifts the discussion and affects where boundaries are drawn between behavior, symbol, and material culture.² While modern categories like "technology" can't necessarily be applied to the Scandinavia of 1000 years ago, identifying historic categories and the boundaries that divided them is difficult. What Guðrun meant when she declared morning works "misjöfn" is confusing.³ 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

¹ Schiffer, Michael Brian, "Introduction," in *Anthropological Perspectives on Technology*. Albuquerque, N.M.: University of New Mexico Press, 2001. p3.

² Paleček, Martin and Mark Risjord. 2013. "Relativism and the Ontological Turn within Anthropology." *Philosophy of the Social Sciences* 43 (1): 9.

³ For discussion of the manuscript variations see Louis-Jensen, Jonna "A Good Day's Work; Laxdaela Saga ch 49" in *Cold Council: Women in Old Norse Literature and Mythology* ed. Sarah M. Anderson. Psychology Press, 2002.

point? How *are* these tasks related in a Viking Age Nordic mindset? Guðrun's comment is often explained as a comparison of quality or amount of work done, but 12 ells of thread is one or two minutes worth of work and nothing is said about quality in either case, so it is difficult to imagine what point she is trying to make if these are the categories she intends.

In this paper, I argue that Guðrun is claiming responsibility for Kjartan's death, and that one of the key categories on which Guðrun relies conflates physical and social mechanisms, encompassing machines and the ability to carry out work at a degree of remove more generally. Mechanisms, within the broader category of "technologies," have the unique ability to transmit and multiply force, to automate labour, and sometimes to obscure what is actually being done. Guðrun may be acknowledging that she has used the social mechanism of *whetting* (inciting men to commit revenge killings) through the symbolism of a physical mechanism.

Economic and Social Power

The principle of whetting is well known in The Icelandic Sagas as a feminine form of social power. Most scholars understand this as a venture out from the female sphere of the home, and into the male political sphere. "Rather than accepting the role of passive victim of men's feuding and power struggles, the female inciter uses words that function as speech acts to empower herself to participate in the male sphere," writes Saga Scholar Jóhanna Friðriksdóttir.⁴ Judith Jesch suggests that women preferred violent retribution because they were excluded from legal compensation.⁵

⁴ Friðriksdóttir, J. *Women in Old Norse Literature: Bodies, Words, and Power*. Springer, 2013.

⁵ Anderson, Sarah M., and Karen Swenson. *Cold Counsel: Women in Old Norse Literature and Mythology: A Collection of Essays*. Psychology Press, 2002. P 36.

Whetting was a ritual act, and its basic structure is well known. Usually, poetic goading was performed over the bloody clothes of the person to be avenged in the presence of a lawful male avenger who would then be expected to gather a crew and carry out the killing. The whetter often had to wait until an appropriate avenger was in a position to succeed, for example, by waiting for him to grow into adulthood and military skill. Identifying who to goad was done based on social linkages between the avenger, the crew he could assemble, the person to be avenged, and the whetter.⁶ Men who had no direct interest in the revenge plot, but who had social links to the avenger could be conscripted based on those linkages.⁷ Avengers seem compelled, sometimes by emotion, sometimes by social pressure, to carry out the killings asked of them, even when they have a clear preference for a legal solution. This is especially evident in *Laxdaela Saga*, when Guðrun makes Bolli kill his own best friend, Kjartan. After Kjartan successfully fends off the three Osvifsons, it is Bolli himself who delivers the killing blow “and straightway Bolli sat down under the shoulders of him, and Kjartan breathed his last in the lap of Bolli. Bolli rued at once his deed, and declared the manslaughter due to his hand.”⁸ Guðrun’s “Eg hefí spurnið... þú hefir vegið” comment comes only a few lines later, when she greets Bolli who has returned home around noon the same day.

Whetting works like a machine does; the whetter performs a technical sequence of actions which rely on specific materials and methods, and this work creates an effect at some degree of remove. Guðrun doesn’t actually do any of her own killings, in each case, men function as her instruments. Whetting is a social act, neither technological nor magic, but saga

⁶ Miller, William Ian. “Choosing the Avenger: Some Aspects of the Bloodfeud in Medieval Iceland and England.” *Law and History Review* 1, no. 2 (1983): 163.

⁷ *Ibid*, 164

⁸ *Laxdaela Saga*, ch 59.

descriptions are often laced with magical elements, as are descriptions of machines in Old Norse poetry. Three Old Norse revenge poems, Gróttasöngr, Darraðarljóð, and Völundarkviða, feature technological assemblages. Gróttasöngr describes a grain mill worked by women. Darraðarljóð describes a loom also worked by women. Though the revenge motif is similar in Völundarkviða, it centers on a smithy worked by a man. While the women exact revenge through magical machines and work songs, Völundr must handle actual weapons. 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 is 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.⁹ There is often an expectation that technological advancement and the intensification of production means larger more centralized sites. In the Viking Age, the reverse is true of many types of technology, including these three.¹⁰ Before 600, large slag pit furnaces were the main smelting technique,¹¹ and the first known blast furnace appears in Sweden, possibly as early as 1150 AD,¹² but during the Viking Age itself, bloomery iron was produced within households, in smaller furnaces closer to the raw materials.¹³ Iron working follows a similar pattern, with itinerant smiths giving way to

⁹ 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.

¹⁰ Tveiten and Loftsgarden, *Viking Age Transformations*. Routledge 2017. P 115.

¹¹ Tveiten and Loftsgarden, p 113.

¹² 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.

¹³ Tveiten and Loftsgarden, p113.

household smiths (like Völundr) during the Viking Age.¹⁴ Before the Viking Age, large hand cranked grain mills were found mainly at temple sites, and after water-mills again centralized grinding and located it outside the home. During the Viking Age, however, small hand mills were a household appliance (fig 2).¹⁵

Technologies of production shaped daily life in households just as powerfully as they shape modern businesses. Households usually included the householders' immediate family and an array of dependents, and they functioned as an economic unit.¹⁶ In the Icelandic sagas, young men of the bondi (householder) 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.¹⁷ Although raiding did happen, young Icelanders typically planned to trade for their fortune, 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 denim.¹⁸ It was a regulated commodity cloth that also functioned as a currency. The word "Snuðr" (to spin) 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.¹⁹

Grain was likely stored as whole kernels and making flour, meal, or cracked grain was a daily task. Ground or cracked grain was a necessity for feast foods like beer and bread, which

¹⁴ Carstens, Lydia. "Powerful space: the Iron-Age hall and its development during the Viking Age" in *Viking Worlds: Things, Spaces and Movement*. Oxford: Oxbow Books, 2014. P. 22.

¹⁵ Baug, Irene. *Stones for Bread. Regional Differences and Changes in Scandinavian Food Traditions Related to the Use of Quernstones, Bakestones and Soapstone Vessels c. AD 800-1500*. University of Bergen, 2015. P. 34.

¹⁶ Gragas ch 78.

¹⁷ This is a common theme in major sagas such as Laxdaela, Egils, and even Jomsvikinga saga.

¹⁸ Although made of wool not cotton, Vadmal shares a weave structure and utility characteristics with denim, as well as a wide range of quality within regulated types. Even the colour was usually the same, as most vadmal was dyed with woad, which contains the same colouring agent as the Indigo used for denim.

¹⁹ Cleasby, Richard, Völundrð Lars Agnarsson, and Gudbrand Vigfusson. *The Cleasby & Vigfusson Old Norse to English Dictionary*. 1874. P 576.

formed the focal point of political life, and was also part of daily foodways. *Graut* (porridge) was a staple needed to fuel grueling physical labour, including maritime expeditions.²⁰ While the importance of weaving is somewhat exaggerated in Iceland because cloth was the major export, clothing, tentage, bedding, sailcloth, and the provisioning of fishing and trading expeditions were important across Scandinavia. If women did not produce sufficient supplies, trade and feasting traditions that were key in the masculine sphere were undermined.²¹ That feminine-coded work relied on more complex mechanisms than male-identified work may have created a sense of mechanical knowledge as female-identified, even somewhat frightening or inaccessible to men.

²⁰ *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 (*Völva*) 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.

²¹ Carstens 2014, 16

Mechanisms in Use

In Gróttasöngur the grinders are the giantesses Fenja and Menja who made the magical grindstones, and who have been enslaved by King Frodi. Initially, they are reasonably happy to grind for him “gold we grind, Frodi, grind glory, grind a multitude of wealth on the joyful slingstone,” but when he pushes them too far, their moods shift.²² The origins of the weavers in Darraðarljóð are less clear, the introduction to the poem (which is not contemporaneous) describes twelve mysterious women seen riding towards a weaving house by a character called Dorruðr. Both Gróttasöngur and Darraðarljóð contain some of 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 grinders chant, while the weavers use a similar formula, “wind, wind... let us not permit his life to be lost.”

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. In Völundarkviða, the bellows are left bloodstained like the cloth in whetting stories, but the boys Völundr killed are never avenged. In Laxdaela saga, when Helgi Hardbienson wipes Bolli’s blood from his spear onto Guðrun’s cloak, Halldor is alarmed, thinking that Helgi has acted gruesomely. Guðrun, however, smiles. Helgi remarks

²² Gróttasöngur, Str 5

that "under this scarf end lies my death," indicating that he knows he is giving her the currency to demand his own death later.²³

Völundarkviða is a convenient contrast, presenting us with an enslaved man forced to forge valuable objects. While Völundr 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 opportunistically. For this analysis, the details of the magic itself are not crucial. What is interesting is the strong association between women, machines, and magic.

The Technologies

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. Both require a familiarity with air-accelerated fires and modified fuels like charcoal. Despite the very real complexity of the technology, however, strikingly little in Viking Age iron working is *mechanically* complex. The trip hammer was a post-Viking Age development. The bellows is emphasized in contemporary iconography of smithing, and is the only tool specifically mentioned in Völundarkviða "there [in the smithy] you will find the bellows sprinkled with blood."²⁴ It is also 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. Even so, it relies on reciprocal motion, the force is generated by the strength of

²³ Laxdaela Saga, ch 55.

²⁴ Völundarkviða str. 34

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.

Even a cursory look at Viking Age craft practice reveals looms as some of the most mechanically complex technologies in use (fig 1). A variety of different types of loom were in use, but Darraðarljóð describes the iconic warp-weighted loom (WWL) which was used for producing bulk cloth. The WWL is ancient and very widespread, and some of the finest woolens ever produced with it were made in Viking Age Scandinavia.²⁵ Textile historian Ben Cartwright argues that the changes in textile production at the end of the Viking Age had wide-ranging effects on lifestyles.²⁶ 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 felting obscured and therefore de-emphasized weave structure and the skill of weavers.²⁷

The warp-weighted loom relies on gravity to stretch the warp (lengthwise threads) and a series of heddles made from looped and knotted cord. In Darraðarljóð, “the fabric is warped with men’s intestines and firmly weighted with men’s heads; bloodstained spears serve as heddle rods, the shed rod is ironclad and pegged with arrows.”²⁸ These heddles -- Darraðarljóð does not specify they are the standard linen or more intestines -- are used to create two or more sheds. Sheds are the pathways the machine creates 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

²⁵ Hoffman, Marta. *Warp Weighted Loom*. New impression edition. McMinville, Or.: Universitetsforlaget, 1975. P 5.

²⁶ Cartwright, 161.

²⁷ Hoffman, 268

²⁸ Darraðarljóð str. 2

manipulating the heddle rods, the weaver progresses through a regular sequence of sheds, passing the weft across the loom each time and “beating” upwards with a weaver’s sword to create a length of cloth at the top of the loom. When enough cloth has been made, the cloth board is rotated, winding the finished work up and out of the way. Then the weights, generally clay donuts rather than heads, 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 chain the warp, hang the weights, and to “knit” the heddles²⁹ form a key element of the technology. The flexibility of these fiber-based machine parts makes the loom itself very flexible. It is relatively easy to change the loom width or add complexity in the form of inserted pile, tapestry elements, or 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 denim 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 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

²⁹ Knitting was not known in the Viking Age, this is a modern term, and slightly misleading in terms of structure.

substantially more time or costly materials. The 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, substantially finer than later examples -- these very fine examples depend on the knitted heddles, as later styles of heddle wear out closely spaced warp threads.³⁰

Most textile technologies require continuous production. Even a small amount of cloth requires a lot of thread to produce. Despite its flexibility in other respects, the WWL is unforgiving of poor materials. Poor warp threads break frequently under the tension from the weights and jostling from the beater. In the same way that Blacksmithing implies iron smelting, use of the WWL implies the use of drop spindles, as wheelspun threads do not stand up well as warps on a WWL. 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 continued to be used well into the medieval period.³¹

The drop spindle exists to allow for continuous output. To make thread on a drop spindle, the spinner knots the thread around the shaft and whorl, and sets the mechanism in motion with a flick of the fingers, regulating the speed at which the raw material is fed, and stopping the twist from travelling too far up the unfinished thread. It is the weight of the tool which draws out the fiber, and the flywheel effect which actually spins the thread. In many

³⁰ Hoffman: 241, 248-9.

³¹ Traustadóttir Ragnheiður. "Spindle Whorls from Urriðakot" in *Nordic Middle Ages – Artefacts, Landscapes and Society. Essays in Honour of Ingvild Øye on her 70th Birthday*. Irene Baug, Janicke Larsen and Sigrid Samset Mygland (Eds.) University of Bergen Archaeological Series 8. 2015. P 320

applications the spindle rotates completely freely, hanging by the fresh thread. Even when it is rolled down the thigh or supported in a bowl, the freedom of the spindle to rotate continuously in one direction is what allows for a theoretically infinite number of twists, and a theoretically infinite length of continuous thread. In practice, the work is periodically rolled up and stored on the spindle shaft (snælduhali) and practically speaking, there will come a point when it is convenient to finish the thread.

Like grinding, the idea of spinning yarn is associated with magic in many cultures including Viking Age Scandinavia,³² 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. 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.”³³

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.³⁴ 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

³² Cartwright, 162.

³³ Jørgensen, Lise Bender. “Spinning faith” in *Embodied Knowledge*. Eds. Marie Sorensen and Katharina Rebay-Salisbury. Onbow Books 2013 p128.

³⁴ Åsa Dahlin Hauken and Timothy J Anderson, “Collection Report: Rotary Querns in the Museum of Archaeology University of Stavanger,” n.d., 161. p48

reduced to flour or meal and automatically directed into a waiting receptacle.³⁵ 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.

Parts of the loom, spindle, and quern all rotate, but there is nothing in a blacksmith shop that does so. It is this mechanical element, not overall technological complexity that links these magical machines.

Embodied Knowledge

Schafer notes that it is important to pay attention to “The profound meanings that inhere in technological activities themselves.”³⁶ That is to say, we need to pay attention to the symbolism not just in objects, but in the act of doing work. In *Darraðarljóð* and *Gróttasöngur*, we find women who possess exclusive knowledge and competencies around mechanisms, how to use them, what they do, and the stories of their origins and symbolism. In *Gróttasöngur*, *Laxdaela saga*, and *Njalls Saga*, men depend on women to handle technologies on their behalf. A link between mechanisms and women may have existed because the feminine territories of kitchen and weaving house were the places where complex machines were to be found, used, and maintained in the Viking Age.

Embodied learning is a factor not just in women’s work or use of rotation, but also in the handling of historically masculine identified tasks like blacksmithing. Men’s and women’s bodies were both altered by heavy and repetitive work, but in different ways. In contrast to the

³⁵ Åsa Dahlin Hauken and Timothy J Anderson. p47

³⁶ Schaffer, 2001, 7

symmetrical changes seen in grinder's arms and shoulders, the arms of archers and blacksmiths become unevenly developed.³⁷ There is an inescapable physicality about a body which has been altered through use, producing functional and sometimes visible postural and muscular differences. Late Iron age nordic culture has been described as “strongly gendered” based on literary evidence, and well furnished burials,³⁸ and that children's ability to conform to gendered expectations was evaluated beginning at an early age.³⁹

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.⁴⁰ While foresight is not an exclusively feminine form of wisdom in the sagas, 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, but 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. Philologist Eldar Heide 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.⁴¹ The male god Oðin learned seiðr, “but this magic, when it is practised, is accompanied by such great perversion [ergi] that it was not considered without shame for a man to perform it.”⁴²

³⁷ (Lang, *egyptian Grinding* p 284)

³⁸ See Kupiek and Milek 2014, 115, see also Lokasenna, Risgþula

³⁹ See the descriptions of young Halgerðr (*Njalls saga* ch1) Egil Skallagrímsson (*Egilsaga*) and Varg (*Jomsvikinga saga*) for examples of introductions which stereotypically include gendered comments about children.

⁴⁰ Tolley 2008, 3

⁴¹ Heide, Eldar. “Spinning Seiðr” in *Old Norse Religion in long term perspective*. Eds Anders Andren and Kristina Jennbert. Nordic Academic Press 2006

⁴² *Ynglinga Saga*, chapter 7.

Representation and expectation also play into gender coding and the process of learning gendered tasks. Sociologists Cynthia Cockburn and Susan Ormrod report that we are often “ready to blame” when a person makes an error doing something that does not accord with gender expectations, but ready to forgive when a person makes the same error doing a task that does.⁴³ Learning often depends on quality feedback, so practice becomes a feedback loop that engages with social expectations. Practicing with technology (often in the form of play) is gendered almost immediately both by adult encouragement,⁴⁴ and the efforts of the child to establish a gendered identity.⁴⁵

“Practices become embodied knowledge, they come to inhabit and affect the body as motor skills and practiced ways of doing things. The body is thus the forum for the learning and performance of belief.”⁴⁶ Skill is more than talent or happenstance, deeply embodied knowledge -- capacity written in muscle, bone and cognition -- is inherently part of history, determining what is possible for a certain historical actor and what is not. It is especially important in understanding the history of daily life, because daily life is made up of a dense stream of tiny choices governed by the capacities of the individuals involved. As “skill is not simply a property of a body but applies to a dynamic system in which a body actively engages its surroundings.”⁴⁷

Masculine technologies of the Viking Age tended to rely on direct application of force, animal or human, for example knowing how to hold a sail against the wind, push the water with an oar, or plough with a living animal. Women’s technologies, on the other hand, often required

⁴³ Cockburn, Cynthia, and Susan Ormrod. *Gender and Technology in the Making*. SAGE Publications, 1993. P 1.

⁴⁴ 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

⁴⁵ Ibid 518.

⁴⁶ Sorensen, Marie Louise Stig, and Katharina Rebay-Salisbury, eds. *Embodied Knowledge: Historical Perspectives on Belief and Technology*. Oxford: Oxbow Books, 2013. P 1

⁴⁷ Schiffer, 2001, 4

correctly setting up mechanisms which could be configured to produce a variety of desired outputs. On one day, a quern might need to be configured to make cracked grain suitable for beer, and on another day the same quern was used to grind fine flour suitable for bread. 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.

By producing effects that only become apparent later, like setting up a pattern using heddles, or where the function is obscured by the machine parts, like in a quern, some of these mechanisms may have created the impression of magic. Combined with the real economic importance of women's work, this magic may have seemed ominous, producing the idea that women could seem to be doing one thing while actually accomplishing something entirely different. 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 household economies, and the instrumental value of women's contributions in a marginal environment.

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 and embodied knowledge. 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."⁴⁸ The distinction between rotary and linear motion is often significant in technological contexts, because rotation, or the transformation between linear and rotational motion is often key to

⁴⁸ Schiffer, 5.

continuous output. In general, machines which rely on unidirectional rotation have greater complexity than those which do not, and even spindles, however simple they appear, are complex machines. Unlike simple machines like leavers (oars, hammers), and wedges (sails, chisels, ploughs), spindles perform multiple actions simultaneously, and it is the energy stored in the machine, not the muscle power of the worker, that does the work. Even when a task is simple, if it involves spinning, it seems to fall to women. A bowstring can be made without any mechanism because of its limited length, and finger-twining is a simple skill that young children can readily learn, yet in *The Saga of Burnt Njall*, Gunnar asks Halgerðr, 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 (snúíð) her hair into a new string. When Halgerðr refuses, Gunnar is slain. In this passage, Gunnar's dependence on his wife is absolute, it involves both his wife's body and her skill.⁴⁹

The rotary quern uses continuous rotation to produce a continuous output, and also visually obscures the actual work, so that a viewer who does not understand the machine sees whole grain go in and ground grain come out, but how exactly this happens cannot be directly perceived. Archaeologist D. H. Heslop notes that the 'mysterious' hidden grinding in rotary querns must have seemed "startlingly magical" when they first took over from the grindstones which were used before.⁵⁰

Looms do not use rotation as the main mechanism (which is the heddles), but it is the rotating cloth board and the process of chaining the warp which allows for the production of

⁴⁹ Brennu Njals saga, ch 77

⁵⁰ Heslop, D. H, and Yorkshire Archaeological Society. *Patterns of Quern Production, Acquisition and Deposition: A Corpus of Beehive Querns from Northern Yorkshire and Southern Durham*. Leeds: Yorkshire Archaeological Society, 2008. P.18.

yardage -- continuous bulk cloth.⁵¹ Lise Bender Jorgensen notes that the magical effect of the loom in *Darraðarljóð* seems connected to the rotation of the fabric board.⁵² In common with Gróttasöngur, *Darraðarljóð* contains some hard-to-translate archaic or technical terms. In particular *darraðr* itself. Saga scholar R. G. Poole notes that “Darradar” is listed in a *Thula* (Mnemonic list)⁵³ 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, 126). If the term refers to the fastening by which cloth and shaft are joined, however, all three meanings might be reconciled. In the same way as *Darraðarljóð*’s magical loom replaces heddle rods with spears, it is technically simple to use a banner standard in the place of the cloth board on a WWL and to prepare the warp directly on the standard. The banner could then be woven onto the standard, with the banner, the fastening, and the standard all turning together as the fabric is drawn up. Regardless of the exact meaning of the word “Darraðar,” both poems emphasize the rotating part of the technological system. While it is clear that the women set up both the loom and the mill, the magic only happens when they grind and wind, “Songu ok slungu snudga-steini” Gróttasöngur reports “they sung and they slung the whorlstone.”⁵⁴

Both the quern and the spindle, then, evoke the a certain amount of magic even in the minds of modern researchers, and the WWL is similarly categorized in the historical sources. Völundr’s work is different, though. Despite the technological complexity, the importance of ironwork both economically and mythologically, and the presence of magic in the poem,

⁵¹ Chaining the warp is a method of knotting that allows bundles of warp to suspend the weights without tangling, and also allows fresh warp to be drawn out of the bundle with the consistency required maintain consistent tension on each individual warp thread.

⁵² Jorgensen, 2013.

⁵³ AM 748 II

⁵⁴ Gróttasöngur Str. 2.

Völundr's tools are not magic. His craft allows him to entice his targets to his forge. The boys through the promise of craft "this they saw: full of craft [the chest] was, they thought they saw red gold and glitter" and their mother through a promise to fix her ring "I will so repair the fractured gold..." His skill even adds a layer of violence by helping him trick the boys' parents into drinking from their own children's skulls.⁵⁵ Still, he must apply his tools directly against them "of those children he cut the heads off... their skulls below the hair he set in silver and gave to Nidud."⁵⁶ Interestingly, none of Völundr's tools are destroyed in the poem, apart from a little blood staining. In both *Darraðarljóð* and *Gróttasöngur*, the machines are destroyed "the shaft will break" chant the women in *Darraðarljóð* and "the strong millstone is broken in two" by the giantesses.⁵⁷

Guðrun's tiny amount of spinning may simply represent the smallest unit of machine use by which she can claim responsibility for Kjartan's death. If so, "eg hefi spunnið... þú hefir vegið" amounts to "I put the plan in motion, and you carried it out."

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 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" now

⁵⁵ *Ibid* str. 22, 27.

⁵⁶ *Völundarkviða* str. 24.

⁵⁷ *Darraðarljóð*3, *Gróttasöngur* 23

proven to contain a woman's skeleton caution us strongly that "we must question our assumptions and categories."⁵⁸ As it becomes increasingly clear that nordic women were powerful within the home, in ritual contexts, 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.

In this paper I have focussed on three poems, Gróttasöngur, Völundarkviða, and Darraðarljóð. Of these, 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 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 continuous rotation that are magical.

Looms and querns occur in the archaeological record in overwhelmingly female contexts. Viking Age poetry about machines suggests that using and maintaining them was the domain of women, and that kitchens and weaving houses were gendered spaces. Economics suggest that everyone, including men, were heavily dependent on women's work in the household economy of late Iron Age and Early Medieval Scandinavia. While reliance on a labour force does not universally imply 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 or quern -- but can also mean "profit."⁵⁹ Notably, the single richest

⁵⁸ Neil Price et al., "Viking Warrior Women? Reassessing Birka Chamber Grave Bj.581," *Antiquity* 93, no. 367 (February 2019): 181–98, P194.

⁵⁹ Cleasby-Vigfusson p 576.

burial known from Viking Age Scandinavia is that of “The Oseberg Queen,” who was buried with an ornate ship, sleighs, a modular cart, a quern, and an array of looms.⁶⁰

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 Viking Age mechanical technologies, those tools which performed multiple functions, required extensive set-up, produced continuous outputs, and relied on rotary motion seem to 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, and 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. If we are looking for a mechanic in the Viking Age, we should probably be looking for someone wearing brooches and skirts and wielding a distaff, because they are the ones who understand the ‘magic’ of complex mechanism.

⁶⁰ Sjøvold, p 33.

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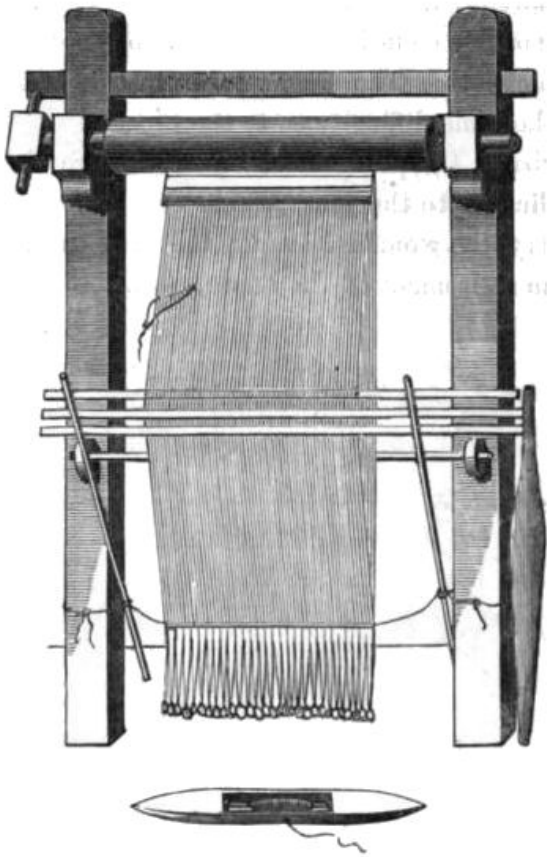


Figure 1: By Alfred Barlow - Digitized by Google, Public Domain,

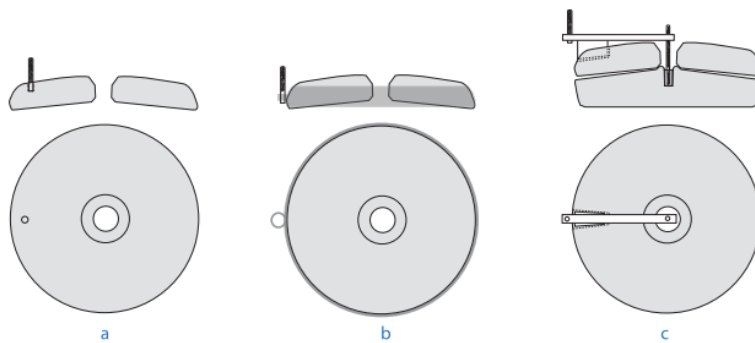


Fig. 32: Schematic representation of the rotary handmill driving fittings. a) vertical handle socket, b) "strap" type handle, c) radial slot handle.

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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.)