

## The Effect of Spin Direction on Cloth Design

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Using a drop spindle, a thread can be spun in either the “S” direction, or the “Z” direction. For a right-handed spinner, the Z direction (turning the spindle clockwise) is most natural, but an experienced spinner can easily spin either way.

Does it make a difference? Some spinners produce a loftier S thread since they do not impart as much energy to the spindle with each twirl of the shaft. But generally, equally sturdy cloth can be made of either S or Z threads, and it was not uncommon in antiquity for cloth to be woven with Z threads in one direction and S threads in the other. Is there a reason to spin in opposite directions, beyond chance or personal preference? The answer is yes.

In 1878 a remnant of plaid cloth was discovered in Brokær, Denmark, dating to the second century C.E. (1). What makes this artifact interesting to me is that the pattern is formed solely by the spin direction of the threads. This project is an experiment to test this phenomenon for myself.

The sett of the artifact is 47/38 per 2x2 centimeters (2), or about 59/47 ends per inch. The thread pattern is 30Z-4S-4Z-4S-4Z-6S-35Z-4S-4Z... in one direction, and 4S-4Z-4S-4Z-4S-32Z...in the other (3). The weave is 2/2 twill.

I believe that the second thread pattern was the warp and the first thread pattern was the weft. No selvage remains to know for certain. While I do not have much experience with setting up a loom, it seems more likely to me that a woman would begin with a regular pattern, rather than a random pattern. I have chosen to use that regular pattern for my weaving.

I have chosen six different breeds to test – Shetland, Jacob, Icelandic, Gotland, BFL, and Romney. The Shetland, Jacob, Icelandic and Gotland are old breeds, while the BFL is post period (4). The Romney resembles a primitive longwool (5). The wool of these breeds has varying degrees of luster and crimp, which I felt could impact the success of the project. Just for fun, I’ve spun with a variety of spindles, both modern and reproductions. I did not expect the spindle choice to have an impact on the results. Some of the fibers were commercially prepared; some I have washed and combed myself. I’ve chosen to spin my threads at about 20 to 35 wraps per inch. While I am capable of spinning a thread fine enough to match the sett of the artifact, I cannot successfully weave with thread that fine. I do not believe the gauge of the thread would significantly impact the results. The various breeds follow in the order in which I wove the samples.

### Shetland

For my first test I used commercially prepared gray Shetland top. Using my #2 whorl, reproduced from an artifact from Ribe, Denmark (6), I spun at 35 wpi\*. I wove a small sample by wrapping the warp around a piece of cardboard. The sett of my sample is 21/16 ends per inch. In bright light the pattern can be seen. Unfortunately, the natural variation in the color of the fiber distracts the eye.

I then tried a sample with the same warp/weft pattern, but woven as tabby instead of twill. The changing threads are still difficult to see, but easier to feel.

### **Blue Faced Leister (BFL)**

For my second piece I chose white BFL, also spun at 35 wpi. I wanted to make a piece large enough to be able to repeat the pattern. Again I began by wrapping the warp on a piece of cardboard. As I wove, I had a very difficult time keeping the warp under tension. The weaving of this sample is so bad that I hesitate to make any comments on the pattern, although it can be seen. The S threads appear to sit lower than the face of the fabric, or Z threads are fuzzier. Before I finished the piece I had the idea to use my tapestry/sprang loom to hold the warp for my remaining samples. I will try another sample of BFL in the future.

### **Jacob**

I chose the Jacob wool for my third test because it is a solid color and has a higher luster than the Shetland wool. Using my #6 whorl, I spun at 30 wpi. I set up the warp on my tapestry loom. Because I had more control over the tension of the warp threads, I was able to pack the weft more tightly. The sett of the sample is 22/18 per inch. The very dark color can make it difficult to see the pattern, however, in sunlight it shows up. While the wool is mainly dark brown, there is an occasional white fiber. This reflects the sunlight and reveals the pattern. A tunic or shawl made with this fiber would have presented a changing pattern as the person moved.

### **Shetland**

As a second test of this breed, to eliminate the color variation of the fiber I spun white Shetland wool using my #23 whorl, at 21 wpi. While there are mistakes in the weaving, the spin variation can be seen as a textural variation in the weave.

### **Icelandic**

Icelandic sheep have dual coats. I combed the tog and Þel together, which made a stronger thread, but also resulted in color variation within the threads. This wool has the highest luster of the breeds chosen. This was spun at 26 wpi. With this sample I was successful in being able to easily see the plaid pattern in the fabric. This was partly due to the accidental dark and light color variation of the S and Z threads. I would like to comb enough of this fiber to make a larger sample.

### **Romney**

The green Romney wool was spun at 23 wpi. This was the only carded wool that I used. Of the solid color wools, the pattern shows up best in this sample. I would need to test other samples of carded wool to know if the difference is due to the breed's characteristics, or to the difference in fiber preparation.

Happy with the ease with which the pattern could be seen in this sample, I combed some medium brown locks, to try a second Romney sample. These threads were spun at 30 wpi. The sett is 19/22 per inch. Again the pattern can easily be seen in both the vertical and horizontal direction. This sample most closely resembles the photo of the artifact.

### **Gotland**

This was the most difficult fiber I worked with for this experiment. Gotland wool is very slippery, and works best when it is spun fine and tight. Even when set, it tends to pull apart under prolonged tension. This makes it difficult to weave as a single. Using my #22 whorl on a shaft I carved to resemble a Greenland find (7), I spun the combed fibers at 32 wpi. I was interested in using this wool because the coloration is similar to the gray Shetland, however, it has a higher luster. Because of the fuzziness of the thread, I was not able to weave as tightly as with the Shetland. While the pattern can be seen when the fabric is shifted in relation to the light source, it was generally no easier to see than in the Shetland sample.

### **Shetland**

I wove enough gray Shetland at 28 wpi, to weave a larger sample. I wanted a piece large enough to see the drape of the fabric. Forgetting to add selvedge threads at the edges, I had difficulty keeping the warp straight over the longer length of the sample. The plaid pattern repeats 6 times, ending with 22 Z threads. With this larger version it is easier to see the pattern as the fabric is turned in the light.

As a final test, I spun white Shetland combed top at 48 wpi, using my #25 whorl. While I had an easier time weaving than with the BFL, it is still full of mistakes. The warp threads stick together and they are so fine that I often ended up getting them twisted. In hindsight, I should have added sizing to the warp threads. While the thread gauge should be sufficiently fine to be similar to the artifact, I was unable to pack the threads closely enough. At a sett of 30/35 ends per inch, it is as close as I have been able to come to the sett of the artifact. The pattern is discernable as a textural change between the S and Z threads.

### **Conclusions**

What I have observed while making these weaving samples of S and Z spun threads is that the luster of the thread is an important component for successful fabric design using this method. The pattern in the cloth shows up because light is reflected differently off the S and Z threads. Also, the threads lie differently in the cloth depending on the direction of the spin. Spinning creates stored energy in the threads. Even when the thread has been set, the energy in the single affects how it behaves when it is held parallel or perpendicular to another thread. I have learned through trial and error that this effect is not changed by thread gauge, weave pattern, sett of the weave, or even skill of the weaver. This combination of reflectivity and stored energy creates a subtle pattern which enlivens an otherwise plain fabric.

\*wpi is an inexact measurement. The number of wraps per inch can vary depending on the elasticity of the particular breed of wool, and the tightness at which a person wraps the thread.



Carded Romney wool on left; combed Romney wool on right



Jacob wool

## **Notes**

1. Hald, Margrethe, Ancient Danish Textiles from Bogs & Burials, p. 85.
2. *ibid.*
3. *ibid.* p. 86.
4. Parkes, Clara, The Knitter's Book of Wool, pp. 62, 68, 72, 73, 75, and Robson, Deborah and Ekarius, Carol, The Fleece and Fiber Sourcebook, pp. 84, 110, 162, 168, 184, 271.
5. Ryder, M.L., Sheep & Man, p. 460.
6. Bender-Jørgensen, Lise, Jensen, Hans Arne (ed.), Ribe Excavations 1970-76, Volume 3, p. 65.
7. Ostergard, Else, Woven Into the Earth, p. 48.

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