



BIRKHILL HOUSE

**CIRCULAR TEXTILES
MODEL**

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INTRODUCTION

What is a circular textiles model and why is it relevant?

Textiles is one off the largest polluting industries in the world. While improvements on an industrial scale happen slowly, smaller changes on a personal basis can pave the way for changes in the industry to become common practice.

A circular economy would be an ideal world where our waste products either get reused or recycled properly to prevent harm to the environment. Therefore, a circular model is a small scale version of this idea applied to one or more practices. My circular model is for woolen textiles production.

While wool is one of the most eco-friendly textile fibres already, it can always be improved upon. Waste water from scouring and washing the fibre before production is incredibly harmful and not always disposed of with care. Generally left to dilute into rivers polluting local ecosystems. So, while waste water can be an issue the dye process can also cause some harmful compounds getting into the environment. These two factors of woolen textile production can be improved upon and that is what my project at Birkhill House focussed on.



WITH THE RESOURCES AT BIRKHILL HOUSE I WAS ABLE TO UNDERSTAND THE BIOLOGY AND CHEMISTRY OF WOOLEN FIBRE BETTER THAN I DID BEFORE STARTING MY INTERNSHIP. THE VAST VARIETY OF DIFFERENT BREEDS OF SHEEP FLEECES AS WELL AS ALPACA WAS VERY INFORMATIVE TO MY PROJECT.

SHEARING

As part of the induction to Birkhill House helping with the alpaca shearing is the first and arguably the most important step as it starts off the journey from farm to yarn.



As an intern with no shearing experience I wasn't allowed to use the actual shears on the alpaca but did help with the fleece collection and then proper storage to keep them in pristine condition. By using mesh sheets to collect the fleeces then roll them up into burrito-like bundles allow the fleeces to be stored away and moved without the cut site becoming meshed together and creating tangles or knots. Being able to compare alpaca fleeces from different aged and coloured alpacas was really interesting as you could immediately tell from touch and sight which fleeces were objectively 'better'.



FLEECE TO FIBRE

After shearing you can then start to process the fleece into fibre. By spreading out the fleece you can take samples from different areas to identify the true staple length of the best fibres in the fleece.

A lot of the edges to the fleece aren't long enough to be part of the same 'batch' of fleece fibres due to their staple fibre length being naturally shorter as it grows out into neck and leg fibres. They also generally contain a lot of scratchy, hard guard fibres which would not make a nice yarn and would irritate the skin.

Some of the edges also have fibres that are naturally straighter without a lot of curl which doesn't interact with other curlier fibres particularly well. This is due to the lack of kinetic energy stored in the curl of the fibre, meaning when spun it won't hold its shape very well and the yarn may fall apart if not given enough twist.

Once the waste fibres (which may or may not be suitable for other activities therefore, should not be thrown away just yet) have been removed the fleece can then be washed.

Luckily Birkhill House uses eco-friendly washing up liquid designed to be gentle to the environment while still washing away bacteria and dirt. So using hot water and a little dish soap is all that is needed to wash a fleece.

The water needs to be boiling to basically melt the lanolin off of the fibres as well as properly wash the grime and dirt away. With alpaca fibre you can gently wash it with your hands without it felting however sheep fibre has more scales and needs as little movement as possible.



COMBING IT OUT

Once washed the fibre needs to be combed or carded depending on the staple fibre length. Longer staple fibres will be combed whereas shorter staple fibres are carded. Once done they will be ready to spin with.



When combing the fibres figuring out where the cut site is is very beneficial due to the way the fibres grow out of the animal. Wool fibre is made up of loads of really tiny scales which grow outwards from the sheep creating a spiralling petal-like appearance. Due to this, spinning the fibre can become more difficult if we are working against the scales, therefore, when feeding the fibre into the spinning wheel or drop spindle the cut site should go in first.

Obviously you can still spin no matter which way you put the fibres in but this will make it easier to have uniform yarn.

I have to admit using the combs was daunting at first as you are waving these 6" spikes around and you have to be very careful of your surroundings.



SPINNING

The fibre is now ready to start spinning.



This is where I really found my passion over the summer. I could not get enough of spinning! I loved taking the washed and combed fibre and turning it into usable yarn I could then knit or weave with. The textures you could achieve were also incredible, especially when you managed to control the thickness of the yarn and put in intentional slubs.

Before this internship I couldn't spin and thought using a wheel was the only way to make yarn by hand but I was introduced to the drop spindle and honestly I am in love. You can take it basically anywhere and spin instead of worrying about a wheel and its set up, a drop spindle fits in your bag (or even a pocket!).

While the beginning was rocky as I got to grips with the technique of feeding the fibre in, keeping the spin and not letting the yarn get too thin and break. Once I got into the flow of it, it really came naturally after an hour. The rest of the summer I was spinning new yarns from new fibres and wanted to see what else I could spin.



NATURAL DYES

You can dye your fibre at any stage of the process, however the continuity of the colour may not be guaranteed at different stages. For example if dyed as a fibre the yarn will have a lot of variation of the colour due to the dye being naturally more concentrated in other areas.

I have tried natural dyes by myself in the past but they never seemed to work out too well for me until Birkhill House and meeting their resident dye expert Sunshine. Sunshine taught me everything from different mordants to use all the way through the dyeing process and how different plants will need slightly more complex processes in order to extract their colour. I never thought I would be able to indigo dye but with Sunshine's help I was able to produce a few samples with some indigo samples being dyed on top of fibre that had already been dyed.



MY SAMPLES

A collection of my trials over the summer in understanding the wool fibre process.



A collection of all the yarn samples I attempted over the summer. Ranging from yarn I made myself from fleece from Birkhill to premade yarns that have then been naturally dyed, or a combination of both.

I tried to focus on plants that are acidic in nature due to wanting it to link to my circular model project, as I want to use the waste water from washing the fleece and fibre to water the plants I then use to naturally dye with. Therefore not even water is wasted during this process.

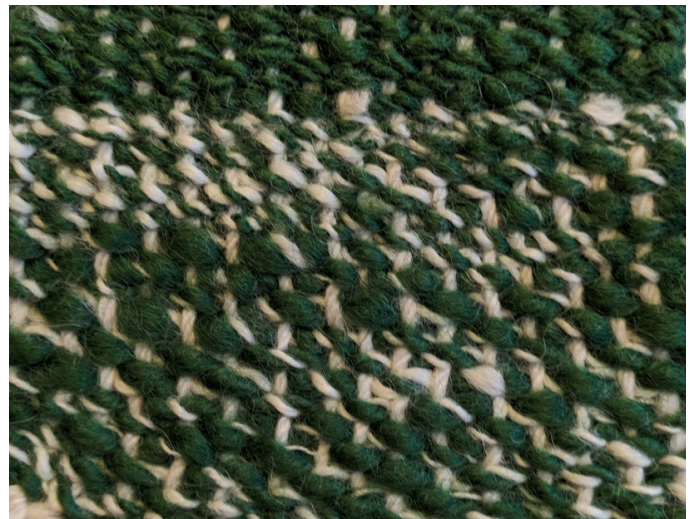
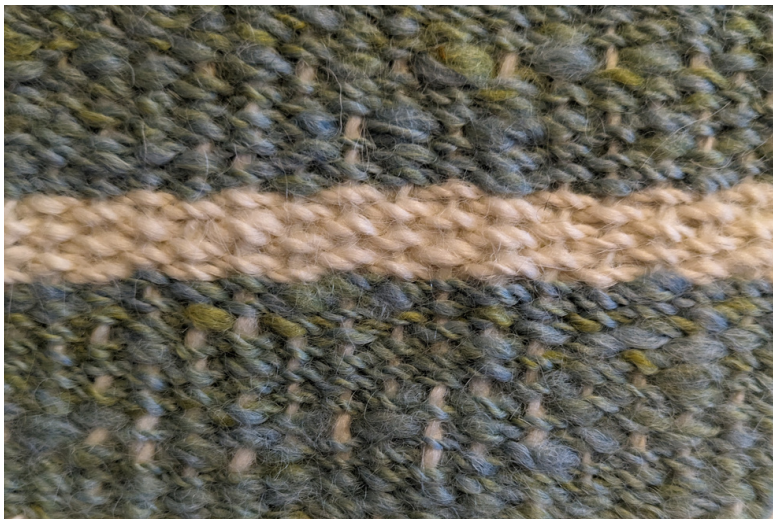
Since wool is naturally acidic, due to the lanolin and other compounds found on it, using acidic plants was the only way forward. If I had used alkaline plants the acidity in the water would have killed them.

Instead of testing the pH levels of every piece of soil I found, I gathered plants from a pine forest as pine trees are naturally acidic, since there have been pine trees here for decades the soils would be extremely acidic. Therefore, the only plants that will survive will be high in acidity.



Once I had quite a few different yarn experiments I was able to weave small samples to show what those yarns may look in fabric form. The yarns I had spun myself obviously had a very textured finish due to the inconsistent yarn thickness.

The naturally dyed yarns were very interesting as some had intentional colour variations whereas other were not supposed to have variations but ended up having different shades flecked throughout.



I even spun yarn from the 'waste' fibres from the fleece that were still usable they just weren't as long as the staple fibre length for most of the fleece. Instead of washing it first I combed, spun then wove before washing and it gave a gorgeous felted bobble effect. This just shows there is no 'right' way to fibre processing as long as it gives a desired effect.



Overall I found my samples to be very interesting and could be applicable on a larger scale however, companies who already use natural dyes do struggle with the longevity of the colour compared to artificial colours. As well as industry machines are only built to be able to process the very best fibre/yarns.

IN CONCLUSION

In conclusion, I feel my project in theory could become an interesting circular model for small scale, hand processed woolen textiles. Waste water from the washing stage can be used on plants without killing them, however, I wasn't able to put that into practice in a desired environment.

For this experiment to be viable I would have to set up different samples of both different plants, as well as several samples per plant to take into consideration all factors such as species and whether only certain plants would survive despite them all being acidic. As well as enough samples, the condition they need to be in would also have to be a controlled environment, preferably a greenhouse with environmental controls such as regulating temperature and humidity so no other factors are influencing the results.

Unfortunately I did not have the resources for this and apart from using the waste water to water my own cutting of an indigo plant I received from Birkhill House, I could not properly demonstrate the theory in action.

While the indigo cutting did survive, was it only because it was for a short period of time that I was using waste water to water it? Or can we actually use waste water to water acidic plants then use them for dyes?

Other aspects of the model such as waste fibre may not be viable for use in the final product, but can be repurposed elsewhere. We got to find out about using waste wool in planters as a fertiliser for plants, as well as putting it in bird feeders for garden birds to take to build nests with. I also demonstrated earlier some of the waste fibre is still worth using as while it isn't the best quality, you can still spin with it therefore can weave or knit with it.

Overall, while my results are tenuous at best I thoroughly enjoyed my time at Birkhill House and have learned skills I will be practicing for the rest of my life. I am already considering spinning my own yarns as part of my honours project in Sep 23 - May 24. I cannot recommend this internship enough for other like-minded people with a fascination for wool as well as respect for our environment.

