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Signed: Renate Geinbrecht

Date: July 6/2019
SPINNING SILK FOR BLACKWORK EMBROIDERY

By Renate Giesbrecht

This in-depth study is submitted to Olds College, Olds, Alberta in partial fulfilment of the requirements for the Master Spinner certificate.

April 2013

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This study is dedicated to the memory of my Mutti (1924 – 1985) and Oma (1901 – 1985), my early stitching teachers and influences. They passed on their love and appreciation of the fibre arts, which stand strong and true with me today.
ABSTRACT

This in-depth study explores the idea of using hand spun silk as the stitching thread in Blackwork embroidery.

I will spin various silks, including Bombyx, Tussah, Muga and Eri, to test their compatibility for use in this form of embroidery. A sample is stitched for each one to demonstrate its use and usefulness.

Included is historical information on the probable origins of Blackwork embroidery and its development to this day, along with a basic 'how to' primer for the stitching process.

Finally, a substantial motif is stitched which demonstrates not only the compatibility, but the beauty of using hand spun silk in Blackwork embroidery.
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INTRODUCTION

I cannot recall a time in my life when needles, thread, fabric and all related items did not entice and excite me. I believe this love of textiles and the fibre arts is 'in my blood'. So when I was in the second level of the Master Spinner program I was required to spin a yarn suitable for canvas work embroidery and then in the next level, a silk yarn suitable for a different form of embroidery, I was intrigued. I enjoyed the process immensely and was fascinated by it. This opened up a whole new world for me. I was overcome by the thought that perhaps it is possible to hand spin the thread used in embroidery on a larger scale. As I considered it, I realized that, of course, at some point in history all threads, including those for embroidery, were hand spun. I knew I needed to explore this further and the idea of spinning for Blackwork embroidery was set.

As I researched the subject I found that silk was the fibre traditionally used for this form of embroidery. Today, various fibres, most commonly cotton, are used for the stitching. Because I am approaching this subject from an historical perspective, silk was the obvious choice of fibre for this study. There are both cultivated and wild silks available and both types required investigation.
A SHORT HISTORY OF BLACKWORK EMBROIDERY

It is almost impossible to know the exact origins of Blackwork embroidery. While it reached the height of its popularity in 16th century England, various forms of black on white embroidery were known in various cultures all over the world. Some historians believe that it was brought to England by King Henry VIII's first wife, Catharine of Aragon, in 1501, but there is evidence to show that it was known prior to her arrival. (Wilson, pg. 211) Blackwork embroidery is documented in Chaucer's Canterbury Tales, specifically "The Millers Tale" written shortly before his death in 1400. The carpenter's wife is described as follows:

Her smock was white; embroidery repeated its pattern on the collar front and back, inside and out; it was silk and black. (Geddes and McNeill, pg. 15)

From this description we can see that Blackwork embroidery was used by the working class at least one hundred years earlier. It seems that Catherine's passion for needlework reinvigorated and popularized an already established form of embroidery, and Blackwork reached its peak during the reign of King Henry VIII. (Drysdale, pg. 10) Just as in modern times, royalty had a significant influence on fashion.

The terms Spanish work and Blackwork were often used interchangeably and sometimes this form was even referred to as
Spanish Blackwork. It is possible that Blackwork embroidery’s origins were in Spain or Africa. As the daughter of Queen Isabella and King Ferdinand, Catherine’s formative years were spent in Spain. Spain was under the domination of the Moors who had conquered it in the 8th century. Many of the older designs appear to have an eastern influence suggesting designs from Spain and the Moors influence there. (Wilson, pg. 211)

The lacy quality of Blackwork embroidery made it a substitute for handmade bobbin lace. “Lace was extremely expensive, having to be imported, and its use was prestigious. A royal court edict was issued, stating that only certain persons of rank could wear lace. The great appeal of Blackwork was its lace-like appearance enabling the wearer to appear more noble than he really was.” (Scoular, 1993, pg. 1)

Portraits painted at that time and which still exist, show the stitching on cuffs, collars, bodices and sleeves. Hans Holbein, an Austrian painter, was hired by King Henry VIII to be the court painter and he meticulously documented the embroidery. In fact, it is in his honour that the double running stitch is also called the Holbein stitch. (Drysdale, pg. 10)

It is amazing that Blackwork embroideries still exist hundreds of years later, in museums in England and some in North America, given the harsh chemicals that were used in dyeing the black silk and the fact that the items were used and subjected to wear and tear, abrasion and laundering. Laundry soap in early times was made of “cow dung, hemlock, nettle, and refuse soap.”
Those ingredients would certainly be a destructive factor for the stitched items. The following is a typical recipe for black dye from much earlier times:

- 15 lb. elderbark
- 12 lb. soot (oak shavings or sawdust)
- 10 lb. vitriol
- 2 lb. wild marjoram
- 6 lb. brown wood
- 1 ½ lb. calcined allum and vitriol mixed
- 4 lb. filings
- As much lye as necessary
- 10 lb. walnut shells

This iron based dye was corrosive to the silk thread. In the remaining ancient pieces often the silk thread has decayed and there are holes to see where the thread once lay, or the thread has faded to a brown colour.

Blackwork was not restricted to costume but was found on household linens and cushions as well. "Beds were hung with silk and embroideries, and sometimes had as many as 3 different coverlets made to match the hangings...All this finery would be on
view, for the bedroom was not then the private place it is today...Being more flexible and softer than needlework on canvas or embroidery in silk and metal threads, Blackwork was particularly suitable for use in the bedroom, even for night shirts, which were just beginning to be worn." (Wilson, 1973, pg. 215)

While Blackwork embroidery was a decoration, it was also used as a practical method of reinforcing clothing parts that would receive lots of wear, such as cuffs and hems, and also a way to hide or disguise spots and stains. (Watnemo) It remained popular in England until the late 17th century. There is not a lot of evidence of Blackwork embroidery during the period 1700 to 1900, but it became popular again in the 20th century. (Barnett, pg. 4)
INTRODUCTION TO BLACKWORK EMBROIDERY

Blackwork embroidery is a very old counted thread technique worked on even weave fabric using simple stitches. It gets its name from the black silk that was traditionally used in this form of embroidery. It has been called "the purest form of pattern in needlework." (Strite-Kurz, 1992, pg.V) The basic principle is a series of single straight stitched thread lines joined to make a pattern. The design grows out of the repetition of these pattern units. Blackwork is unique in needlework as it relies totally on lines and contrast for pattern - a close pattern with stitches close together produces a dark effect and a light effect is achieved with an open pattern. Other forms of needlework incorporate other variables such as colour and texture.

Blackwork embroidery is a monochrome technique, traditionally black silk thread on a white linen background. Metallic threads were sometimes used to add richness and give an elegant effect. Today, a variety of thread and fabric are used and the term 'Blackwork' is used to refer to a technique rather than a colour combination. Modern stitching relies on the contrast between light and dark, no matter what particular light or dark is used. There are a variety of threads in use today, including silks, metallic, rayons, and most often cottons. The fabric is often a cotton or cotton blend but linen is also still in use.
While Blackwork embroidery looks rich and sophisticated, in reality, it is quite simple. No complicated stitches are used even though the finished product has an intricate look. A few simple stitches create complex designs.
Fine linen was used historically but any evenly woven fabric can and is used today. It does not have to be fine - even working on fabric that is 16 threads to the inch can produce striking results. The important thing is that the fabric is an even weave and the thread grist matches whatever count is used. This means there are the same numbers of warp threads as there are weft, equal in diameter, in every inch. Both warp and weft must be clearly visible and easily counted. In linen fabric there are natural slubs but they are consistent throughout. Cotton fabrics and other blends are slub-free, smooth and even.

Because I am approaching this subject from an historical perspective, the samples found in the study have been stitched on 25 count linen over 2 threads. That means there are 25 threads per inch in both warp and weft in this fabric. With fabric count, the higher the number or 'count', the finer the fabric - there are more ends and picks per inch. Commercially, linen that is recommended for Blackwork embroidery is commonly available in counts from 20 to 32. I chose 25 count as a 'middle of the road' count. The linen I am using is Dublin linen in both a cream and antique white colour.
STITCHES

The stitches used in Blackwork embroidery are not complicated. They are based on 3 simple stitches—cross, running (also known as Holbein stitch), and back stitch. Some stitches, such as running stitch, produce a reversible effect that can be important when used as clothing embellishment, where both sides are visible.

When stitching and testing the hand spun silk for suitability, I used a combination stitch, that is, a combination of back stitch and running stitch. Reversibility is not a required element here.

Blackwork embroidery is done by stitching over 2 or more threads of fabric. It is best to use the ‘stab’ method where the needle comes straight from under the fabric and then is inserted straight down. This differs from the sewing method where the needle is brought up and down into the fabric, taking several stitches at a time in a rocking manner. The stab method produces more even, consistent stitches in Blackwork embroidery.
CROSS STITCH

X = a single cross stitch

Needle up at A, down at B, up at C, down at D.

.B  .D
.C  .A

RUNNING STITCH

Row 1: needle up at A, down at B

Row 2: (shown in red) needle up at C, down at D

A__B  D__C  A__B  D__C  A__B
BACK STITCH

This stitch is worked from A to B, then up at C. For the second stitch the needle will go down at A and come up at D. The third and subsequent stitches are made by going down into the previous stitch - for the third stitch this is C - and coming up a stitch length ahead of the last entry point - for the third stitch this is E. The needle always comes up one stitch length ahead of the last stitch.

E. D. C. A. B.

COMBINATION STITCH

This stitch is a combination of both running and back stitch. The first stitch, A - B, is a running stitch and the second, C - D is a back stitch. These 2 stitches are alternated.

To work the combination stitch, the needle comes up at A and goes down at B. Then the needle comes up at C and goes down at D. This sequence of A to B and C to D is repeated throughout.

C__DB__AC__DB__A
NEEDLES

The size of the needle used in Blackwork embroidery is important. If it is too large, it can distort the fabric and if it is too small, it will abrade the thread and wear it out prematurely. The needle must slide easily between the fabric threads without stretching the holes or splitting the fabric.

Generally a blunt tapestry needle is used which helps in reducing the risk of splitting the fabric. Sizes used in this form of needlework range in size from 18 - 26. As with fabric, the higher the number is, the finer the needle.

FRAMES

Stretching the working fabric in a frame or hoop helps maintain a uniform tension by keeping the fabric taut. Also, it makes it much easier to count the threads of the fabric and see where you need to stitch.

When using a hoop it is a good practise to cover the hoop with strips of fabric or twill tape prior to stitching. This reduces the chance of marking the stitching fabric with crease lines. At the end of each stitching session the hoop should be removed to minimize permanent hoop lines.
THREADS

For many years silk was the thread of choice in Blackwork embroidery but in modern stitching any thread that is not too stretchy is used. By far the most common is cotton, which is available in many forms and colours, including six strand floss and perle cotton.

The grist of the thread must match the background fabric and cannot distort the fabric in any way. The appropriate thread won't stretch the holes but does not appear to be skimpy either. To some degree, that is a subjective call — what one person considers to be skimpy is not so for the next. The threads should be smooth to show off the patterns with crisp, clear lines.

In order to reduce friction on the yarn caused by the motion of it being pulled through the fabric over and over, it is best used in fairly short lengths, about 18 inches at a time. This reduces the chance of the yarn becoming fuzzy and visually distorting the design.
When finishing a Blackwork embroidery piece, standard needlework finishing practices apply. The piece is soaked in cool to warm water to which there has been added a small amount of mild soap. Any stains or spots are treated very gently with a direct application of mild soap. Then the piece is rinsed with a small amount of vinegar added to the final rinse to neutralize any residual soap.

The piece is laid flat to dry and then gently pressed from the back side with the use of a pressing cloth.
SPINNING SILK FOR BLACKWORK EMBROIDERY

All samples in this study, except the comparisons of wild silks—tussah, muga, and eri—were spun from black bombyx silk. A product of Louet, this black bombyx silk recently became available commercially. All samples were spun on a Kromski, Sonata spinning wheel.

Spinning fine black silk presents some challenges. Based on previous experience and also the work for this study, I would suggest the following tips to make the spinning effortless and enjoyable.

1. I found the use of a good light essential. The OTT light, which is a broad spectrum daylight bulb, was the best and I used it not only in the evenings but also during low light level days.

2. I adjusted the tension on the spinning wheel to a point where there was no pull on the fibre but it still fed onto the bobbin. A high ratio whorl, at 18 to 1, was used on all samples.

3. Silk fibres snag on any rough spots so it was critical to keep my hands smooth with the regular use of hand lotion and scrubs.

4. I kept a spinning cloth on my lap with the white side up when spinning black fibres and the black side up when
spinning light coloured fibres. This helped to see what was happening.

5. As a session of spinning was completed, I found that attaching a small piece of masking tape to the end of the spun yarn made it easy to locate that end when I was ready for the next session or plying.

6. As I spun I changed hooks frequently and always made a mental note which hook I was working on. That way if the end was accidentally lost, it wasn’t lost forever. I knew the area I was working in and could more easily retrieve it.

7. Both Sherman (Spin Off, summer 1994, pg.78) and Rhoades (Spin Off, spring 2004, pg.59) recommend slitting the top lengthwise into strips that are proportionate to the size of yarn desired when spinning for embroidery thread. Having been admonished for this very thing in the past, I decided to spin the first skeins without splitting the top. What I found was that there was some tangling in my hand which led to inconsistencies. The results were not satisfying. Because of those results, all the samples in this study were spun by splitting the top into manageable and proportionate widths, approximately ¼ inch.

8. The distance I kept my hands apart during spinning was slightly more that the length of the silk fibres. This made drafting a smooth process. Both Rhoades (Spin Off, spring 2004, pg. 59) and Sherman (Spin Off, summer 1994, pg. 79) stress the importance of this step and add that a
light touch must be used to keep the fibres smooth and aligned. I found this to be essential.

9. The spinning wheel used needs to be kept in top operating condition. That is, all moving parts are clean and well oiled.
SILK FIBRE SAMPLES USED IN THIS STUDY

Black Bombyx  Bombyx Brick  Tussah  Muga  Eri
Because I have experience in Blackwork embroidery with the use of commercial threads, I knew where to start in terms of grist. This thread seemed fairly fine as I spun it but when I started to stitch the sample I knew almost immediately that the grist was too heavy for this fabric. Not only does the stitching look too bulky, but the design is distorted. Even from a short distance the design looks like blobs on the fabric. The definition that should be there is not.

Stitching with this thread was difficult as the grist of the thread is too large for the holes in the linen fabric and had to push threads open to accommodate it.
SAMPLE 1

Content- bombyx silk
Preparation- top-split lengthwise
    into ¼ inch strips
Spinning Technique- worsted
Twist direction- zzs
Twist angle- 24 degrees
Plies- 2
TPI- 6
WPI- 26
Count- 4.3NM
Finishing- short soak in warm, soapy
    water, rinse, hung to dry
DETERMINING GRIST AND ANGLE OF TWIST

SAMPLE 2

The grist of this thread is a big improvement over sample 1. The design shows much more clearly and is showing some definition as compared to the previous 'blobs'. For the most part stitching went smoothly and the thread showed no problems with abrasion. Another sample, somewhat finer and with a higher angle of twist is in order to make a fair comparison.
SAMPLE 2

Content- bombyx silk
Preparation- top-split lengthwise
  into ¼ inch strips
Spinning Technique- worsted
Twist direction- zzs
Twist angle- 27 degrees
Plies- 2
TPI- 9
WPI- 34
Count- 6.7NM
Finishing- short soak in warm, soapy
  Water, rinse, hung to dry
I am very pleased with this thread. The design shows clearly with good definition and is easily recognizable, even from a distance. The silk thread pulled through the fabric smoothly and did not distort any threads in the fabric. It showed no signs of stress with the repeated action of pulling it through the fabric and there were no abrasion issues.

I must conclude that for 25 count linen fabric, a silk thread spun at 10 - 12 twists per inch with a 33 degree angle of twist is ideal.
SAMPLE 3

Content- bombyx silk
Preparation- top-split lengthwise into ¼ inch strips
Spinning Technique- worsted
Twist direction- zzS
Twist angle- 33 degrees
Plies- 2
TPI- 10-12
WPI- 40
Count- 8.6NM
Finishing- short soak in warm, soapy water, rinse, hung to dry
DIRECTION OF TWIST

SAMPLE 4

SAMPLE 5

In their articles on spinning for embroidery, neither Sherman (Spin Off, summer 1994, pg.78 - 80) nor Rhoades (Spin Off, spring 2004, pg.62 - 63) make mention of twist direction when spinning thread for use in embroidery. This caused me to wonder - is this not an issue, is there no difference at all or was it an oversight? I needed clarification on this point.

I spun 2 threads - sample 4 is spun zzS and sample 5 is spun ssZ. In stitching I encountered no issues with the zzS spun thread. The thread stood the test of stitching beautifully. It did not untwist during use and showed no signs of wear or stress. When stitching with the ssZ spun thread I found it gathered extra twist and to remove that I would have to let the needle and thread hang down freely until it straightened out. If I didn’t do that, snarls occurred and were an annoyance to remove. The ssZ thread showed no signs of wear or stress.

When critiquing the finished stitched samples I did not find a difference as both turned out well. Visually they are very similar.

I am a right handed stitcher and it is possible that a left handed stitcher would not encounter the excess twist problem.
Even though it was not a major issue, I would still conclude that for my Blackwork stitching I will spin a zzS thread.
SAMPLE 4

Content- bombyx silk
Preparation- top-split lengthwise
    into ¼ inch strips
Spinning technique- worsted
Twist direction- zzS
Twist angle- 33 degrees
Plies- 2
TPI- 11
WPI-39
Count-7.3NM
Finishing- short soak in warm, soapy
    water, rinse, hung to dry
COMPARISON OF SPUN SAMPLES 4 AND 5
SAMPLE 5

Content- bombyx silk
Preparation- top-split lengthwise
   into ¼ inch strips
Spinning technique- worsted
Twist direction- ssz
Twist angle- 33 degrees
Plies- 2
TPI- 10-11
WPI-39
Count-7.3NM
Finishing- short soak in warm, soapy
   water, rinse, hung to dry
In order to compare spinning techniques and find the most suitable one for use in Blackwork embroidery, I spun one sample (sample 6) with a worsted draft and another (sample 7) with a semi-worsted draft.

I used a short, forward draw for the worsted and did not allow the twist past my forward hand. The back hand simply very gently held the fibre supply and released it as needed.

For the semi-worsted sample I allowed the twist past my forward hand but not into the fibre supply as would be the case in woollen spinning. Both hands drafted - forward and backwards. The semi-worsted was easier to draft as the worsted required considerable attention in order not let the twist past the forward hand. It tended to cramp my fingers, an issue that is aggravated by spinning fine thread with lots of twist.

The important result lies in the finished product, both the spun thread and the stitched pieces. To the naked eye there is no significant difference. Therefore, I examined both skeins and both stitched samples under magnification and even that did not reveal any differences of note.
Because the semi-worsted draw is slightly easier to execute in this instance and there is no negative effect on the thread, this is the spinning technique I will use when spinning thread for Blackwork embroidery.
SAMPLE 6

Content- bombyx silk
Preparation- top-split lengthwise
    into narrow strips
Spinning technique- worsted, short
    forward draw
Twist direction- zzs
Twist angle- 33 degrees
Plies- 2
TPI- 10-11
WPI- 40
Count- 8NM
Finishing- short soak in warm, soapy
    water, rinse, hung to dry
COMPARISON OF SPUN SAMPLES 6 AND 7
SAMPLE 7

Content- bombyx silk
Preparation- top-split lengthwise
   into narrow strips
Spinning technique- semi-worsted, both
   forward and back draw
Twist direction-zzs
Twist angle-33 degrees
Plies- 2
TPI- 10-11
WPI- 39
Count- 7.8NM
Finishing- short soak in warm, soapy
   water, rinse, hung to dry
SPINNING TECHNIQUE

SAMPLE 8 - Worsted with Combed Fibre

When I examined the black silk top I have been spinning I found that in true top style all the fibres are of the same length, about 8 inches long. There is the odd little nep in it, which is easily removed, but for the most part it is pristine. Clearly, this top did not need further combing.

I pulled apart a silk brick and found the fibres varied in length. The various rovings from different suppliers and companies also showed significant differences. I chose to comb the brick using English combs.

There was a lot of 'waste' from the combing process - about 35 percent, although it is not true waste as it will be used in other blends at another time. I found that I had to be careful not to over-comb which caused neps to form. One or two passes was enough to separate the long fibres from the short. A diz was used to pull the fibres into a sliver.

If I were spinning silk from a brick for Blackwork embroidery, I would comb it first. The end result is excellent, both the spun thread and the stitched sample. The spinning process went very smoothly with this preparation.
Bombyx silk bricks are pure white so this skein was dyed using Ashford Acid dye. By using a 10 percent depth of shade the black colour was successful.
SAMPLE 8

Content- bombyx silk  
Preparation- silk brick, then combed and pulled through diz  
Spinning technique- worsted  
Twist direction- zzS  
Twist angle- 33 degrees  
Plies- 2  
TPI- 11-12  
WPI- 40  
Count- 8NM  
Finishing- short soak in warm, soapy water, rinse, hung to dry
OVERVIEW OF SILK

Bombyx

The bombyx mori caterpillar is now totally domesticated and there are no longer any in the wild. The main producers are China and India. This caterpillar eats only mulberry leaves producing a bright, white, high lustre silk. (Cook, www.knitty.com/issuespring06/FEATbombyx.html)

Tussah

This wild silk is produced in China, Korea and India. The tannins in the leaves (Arjun and Oak trees) these caterpillars eat, give it the honey beige colour. It is considered a wild silk but is raised and controlled by producers.

Muga

Most muga silk is produced in Assam, India, where the caterpillars eat the leaves of the Soom tree. It is a wild caterpillar producing a golden coloured silk. According to Selk (Spin Off, spring 2000, pg.67) it is a more delicate silk than others. A company that sells muga states on its website (www.louet.com/fibres/silk.shtml) that muga cannot be bleached
or dyed due to its low porosity and that its lustre increases after each wash.

Eri

The main eri silk producing areas are northeast India, some parts of China and Japan. The silkworms feed mostly on Castor bean, Manioc and Kesseru leaves. Other than bombyx, it is the only completely domesticated silkworm. Eri silk is a creamy white colour, has some elasticity, and a semi-matte finish. (Treenwaysilks.com/founders.php)
SPINNING BOMBYX, TUSSAH, MUGA AND ERI SILK

Spinning tussah, muga, and eri was quite different from spinning bombyx silk. There was a distinctly different feel and the fibres did not glide past each other as smoothly. Because they are not slippery like bombyx, in some ways, it makes them easier to draft and spin.

I found a substantial variation in staple length - bombyx at 8 inches, tussah at 4 1/2 inches, muga at 3 inches, and eri at 4 inches. Even though all were spun in the same manner the tussah is the hairiest thread. The eri silk has a very 'cottony' feel to it while spinning and the muga felt crisp. If I put too much twist into the muga yarn, it broke.

Tussah is more lustrous than muga or eri yet is less lustrous than bombyx silk. Tussah, muga and eri fibres produce a thread that is more textured and less sleek than the bombyx. When you pull a strand of hand spun wild silk through your fingers it feels much like a miniature string of pearls.

In the stitched samples all these differences apart from the lustre, are minor. By far, the bombyx has the most lustre. Even the slightly more textured thread worked out fine as each stitch is short, under an eighth of an inch in length. All threads performed well in terms of stitching. Even after repeated use there were no signs of abrasion or wear. Because of the hairiness of the tussah the stitches don't show definition as well.
SAMPLE 9

Content- tussah silk
Preparation- roving
Spinning technique- semi-worsted
Twist direction- zzs
Twist angle- 33 degrees
Plies- 2
TPI- 10-12
WPI- 38
Count- 8NM
Finishing- short soak in warm, soapy water, rinse, hung to dry
SAMPLE 10

Content- muga silk
Preparation- roving
Spinning technique- semi-worsted
Twist direction- zzS
Twist angle- 33 degrees
Plies- 2
TPI- 11-12
WPI- 40
Count- 8NM
Finishing- short soak in warm, soapy water, rinse, hung to dry
SAMPLE 11

Content- eri silk
Preparation- roving
Spinning technique- semi-worsted
Twist direction- zzs
Twist angle- 33 degrees
Plies- 2
TPI- 11
WPI- 38
Count- 8NM
Finishing- short soak in warm, soapy water, rinse, hung to dry
DYEING SILK

Ashford Acid Exhaust dye was used to dye the silk black. The instructions for use are included with the dye purchase and also in the *Ashford Book of Dyeing.* (Milner, pg.168)

I made a 5% stock solution and used it to produce a 10% depth of shade on the silk. Black can be a difficult colour to achieve so a strong depth of shade was required. To calculate how much 5% solution to use, I used the formula as given in the book which states:

\[
\text{Volume of dye solution needed (mls)} = \frac{\text{weight of fibre (gm)} \times \text{depth of shade (\%)} \times \text{strength of dye solution}}{100}
\]

When simmering the silk I did not allow the temperature to exceed 185 degrees so not to compromise the silk’s lustre. Standard dyeing procedures and safety measures were used throughout the process.

The dye results were interesting. I dyed 4 samples – eri silk which is naturally a creamy, white colour, bombyx, a pure white, tussah, a natural tan colour and muga, the darkest with a golden honey colour. All 4 samples dyed successfully but the
original colour did affect the dyed colour. The white fibres of 
bombyx and eri became the truest pure black.

Contrary to the supplier's claim that muga silk cannot be 
dyed, I found it dyed quite well. Because of its original 
colour, it is not a pure true black but it is close, certainly 
close enough for this work.
I wanted to stitch a design that was substantial enough to put the hand spun silk to a rigorous test. The Celtic cross I chose incorporates various elements of Blackwork embroidery. That is, there are areas of outlining, areas with dense patterning and areas with larger overall designs. Stitching this design would show how the thread looks in various applications, plus there is enough work involved in this design to assess how the silk thread performs with use on a more major piece of stitching.

I chose to spin bombyx silk for this project because of its lustre and sleekness. Based on the previous samples, I found that the other silks also stitched up well but the bombyx surpassed them with its lustre and sheen. Not only is this characteristic evident in the finished stitched piece but it also makes a difference in the act of stitching. The thread glides through the fabric effortlessly.

Pattern: New Stitches, 1996, pg.48
SAMPLE 12

Content- bombyx silk
Preparation- top-split lengthwise
    into ¼ inch strips
Spinning technique- worsted
Twist direction- zzS
Twist angle - 33 degrees
Plies- 2
TPI- 11-12
WPI- 40
Count- 8NM
Finishing- short soak in warm, soapy
    water, rinse, hung to dry
CONCLUSION

I found the process of hand spinning silk fibres for thread to use in stitching in the Blackwork technique extremely satisfying. I have always enjoyed the process of stitching but now am able to add another layer to that satisfaction by spinning the threads.

Silk's exquisite lustre and sheen which surpasses other natural fibres, makes it an obvious choice for Blackwork embroidery. Added to that smoothness and flexibility is a high tensile strength that gives it the strength to withstand the rigors of abrasion it is subjected to in the stitching process.

Through the experiments I discovered that the silks other than bombyx, that is, tussah, muga and eri can certainly be used for stitching, with acceptable results. However, I consider bombyx to be the top grade of stitching thread. Its lustre, suppleness, strength and colour render it ideal.

Although silk is fairly expensive in its fibre form, to use it as a stitching thread is a small cost. A little goes a long way in spinning thread which has a grist suitable for stitching.

I found that when one is purchasing silk fibres for spinning thread it is of utmost importance to examine the fibres carefully and understand what you are buying. A thorough examination to check for consistency in both staple length and grist of fibre is critical. Preparations, though of the same
type and name, vary in quality. I discovered that the silk brick showed great variance and needed to be combed in order to achieve a top grade embroidery thread.

I was pleased and surprised with the dyeing results. Contrary to the supplier's claim, the muga silk did accept colour and I achieved a reasonable result. While the colours on some of the silks were not quite as intense and true as on the bright white bombyx, they were better than I expected and quite acceptable. The best results were obtained on the bombyx silk.

It was interesting to gain some knowledge on the history of Blackwork embroidery, to discover its origins and then see how it spread around the world into various cultures, into the form we have today.

It was a challenge and a pleasure to achieve the perfect thread for blackwork embroidery. Through experimentation, I was able to determine the correct grist, at 10 to 12 twists per inch, for use on the background 25 count linen fabric. The 33 degree twist angle allowed the thread to perform well during the stitching process but also showed the silk's lustre in the finished product. With these specifications, the silk embroidery thread beautifully showcased the Blackwork pattern on the fabric, with crisp, clear lines and no distortion.

Not only is it possible to spin silk for Blackwork embroidery, hand spinning offers more possibilities than the use of commercial thread. It gives the spinner and stitcher control
over the grist, which can be varied to achieve different results and the twists per inch, which can be increased or decreased as needed. Unlike commercially spun silk, hand spun silk thread has some inconsistencies which could be seen as negative. After these studies in both spinning and stitching with the hand spun thread, I believe this is minor and actually adds to the beauty and charm of the finished embroidery.
STITCHED SAMPLE DESIGN SOURCES

All stitched sample designs taken from Linn Skinner's *Blackwork Charts* unless otherwise noted.

Sample 1..........................Snow............................................................page 8
Sample 2..........................Snow............................................................page 8
Sample 3..........................Snow............................................................page 8
Sample 4..........................Aragon......................................................page 20
Sample 5..........................Aragon......................................................page 20
Sample 6..........................Feather...................................................page 20
Sample 7..........................Feather...................................................page 20
Sample 8..........................Feather...................................................page 20
Sample 9..........................Gill............................................................page 3
Sample 10..........................Gill............................................................page 3
Sample 11..........................Gill............................................................page 3
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