Applications of Cross Dyeing with Natural Dyes

Catharine Ellis
catharine@ellistextiles.com

Follow this and additional works at: http://digitalcommons.unl.edu/tsaconf

Part of the Art and Materials Conservation Commons, Art Practice Commons, Fashion Design Commons, Fiber, Textile, and Weaving Arts Commons, Fine Arts Commons, and the Museum Studies Commons

http://digitalcommons.unl.edu/tsaconf/953
Applications of Cross Dyeing with Natural Dyes

Catharine Ellis
catharine@ellistextiles.com

I am a weaver and a dyer with a passion for continued investigation of these disciplines. My work integrates the two processes of weaving on the loom and dyeing the cloth after it is removed from the loom. I have spent over 25 years developing and refining a technique that I have named woven shibori. Supplemental threads are woven into the cloth while it is on the loom. Once the weaving is complete, the supplemental threads are used to gather the cloth, creating a resist for dyeing or shaping.

Both weaving and dying are essential to the final textile. I continue to experiment with new ways of integrating them. A number of years ago I was inspired by an early to mid 20th century belt from Morocco. I believe this piece was woven with the intent to dye it. The warp is wool. The weft includes stripes of wool and cotton. It has been folded to create a resist and dyed with an acid dye. The dye only attached only to the wool fiber. Using this textile as a starting point, I began an exploration of my own. I wove fabrics with both wool and cotton yarns and incorporated woven shibori resists. I used synthetic acid dyes that attached only the protein fibers. The ability to make such fabrics is unique to the hand weaver.

Cross Dyeing:
A method of coloring fabric made with strategically placed yarns of 2 or more different fibers. A pre-planned effect becomes visible by dyeing the fabric in different dye baths, one for each of the types of yarn.
Ten years ago I made a change to my practice and a commitment to use only natural dyes. This change has come with a steep learning curve that has led to many experiments and investigations. I set out to re-visit the process of cross dyeing but this time with natural dyes.

I wove test samples constructed of protein (wool and silk) and cellulose (cotton) yarns and applied mordants and dyes, hoping to achieve a similar contrast between the different fibers. The initial tests were unsuccessful. Since cellulose was more difficult to dye, I had hoped for a high contrast between the cellulose and protein fibers but both fibers always took the color. Although the cellulose was somewhat lighter than the protein fibers, there was not enough contrast to make the cross dyeing effective.
Direct dyes, such as black walnut, henna, and lichens, were more effective. No mordant was required and they only dyed protein fiber. Fabrics woven of wool, cotton and silk resulted in a successful cross-dye effect because only the protein fibers accepted the dye.

The use of indigo took these fabrics to a new level. When the fabric was over-dyed with indigo, the blue dye attached strongly to the un-dyed cellulose fibers, while only lightly coloring the protein fibers. Indigo has a greater affinity for cellulose fibers than protein. When combined with direct dyes the indigo is the only dye that attaches to the cellulose. This was the beginning of a new way of designing cloth for me: cross dyeing with two different types of natural dyes. Yet the palette was at this point limited to direct dyes: brown from walnuts, and gold from lichens or henna, plus indigo.
As I contemplated these limitations, I learned of another approach to working with natural dyes. Michel Garcia, French dyer and researcher, showed me a process he calls a one-bath method of dyeing or “mono-bath”, which is ONLY suitable for protein fibers. This approach uses natural dye like an acid dye. No mordant is necessary. A gallic tannin and an acid are added to the dye bath. The tannin attaches readily to the protein fiber, increasing the affinity of the dye for the fiber and helping the dye to bind. The colorless gallic tannin does not interfere with the color of the dye being used and improves the light fastness. Vinegar or another mild acid keeps the dye dissolved and makes the fiber more receptive to the dye by enhancing the electrical attraction between dye and fiber. In effect, the natural dye behaves like any synthetic acid dye and is the perfect solution for the cross-dyed fabrics.

As with all acid dyes, these dyes are extremely lightfast. The process is not suitable for every dye, such as flavonols, but it is effective with anthraquinones, naphthaquinones, and some tannins. These restrictions do not limit the palette, as it includes all the red dyes (madder, cochineal, lac) and yellow dyes such as rhubarb root and dock root. Indigo completes the palette. The colors achieved with the one-bath process are slightly different than those obtained from traditional mordant dyeing. A fabric constructed of both protein and cellulose fibers will resist the dye wherever the cellulose is part of the construction. It is like weaving with an invisible pattern, and the woven design is revealed only after the cloth is dyed. When combined with indigo, the palette becomes more complex. When combined with indigo plus resists, there is unlimited potential for design.
Woven wool and cotton, undyed (left) and dyed with lichen, madder, and cochineal

One bath acid dye on wool, silk and wool/cotton woven fabric: madder, cochineal and lac
I continued to make small pieces and singular lengths of cloth. In 2014, when collaborating with designer, Libby O’Bryan, I needed to weave and dye several lengths of yardage for a coat ensemble using the approach of cross dyeing. The wool and cotton fabrics were first dyed with madder, and subsequently dyed with indigo. I kept very careful control of dye quantity and time in order to dye all the pieces the same even color. Following the indigo dye, the cloth was neutralized in a vinegar rinse, and then boiled out (simmered for about 10 minutes) as part of the finishing process for indigo. I did not keep careful track of the time in the simmering bath. As a result I learned an important lesson in this last step. The madder, applied as an acid dye, behaved just like any other acid dye and was released from the fiber in the heated bath. Washing at high temperatures can break the bond between the fiber and the dye. This will cause some of the dye to be released from the fiber into the water bath. Since I did not keep track of the time in this finishing bath, each length of cloth resulted in a slightly different color.
A warm water rinse is adequate for acid dyes. But it is not sufficient for indigo. Any excess indigo dye must be removed from the cloth and the boiling or simmering helps to bind the dye molecules to each other, make a faster dye.

As a result of these observations I changed the sequence of dye application. Indigo is now always the first dye, followed by the one-bath acid dye. Usually a resist is used when dyeing with indigo. This change of sequence saves steps and results in better dyeing. The one-bath heated acid dye both neutralizes the indigo and boils out the indigo to finish it.

As I continue to apply the process of cross dyeing to my own woven cloth, I am attracted to simple woven patterns that can highlight the different fibers. I visited the Jinze Art Center in China in 2014, where Edith Chung was the textile program director. She showed me some of the local “tubu” cloth. These hand-woven cotton fabrics were made in the 1950’s through the 1970s. “Tubu” can be translated as “native” or “local”. These fabrics were woven in many regions of China for local garment construction. Most fabrics were plain tabby weave, woven with commercially spun yarns that had been synthetically dyed.

I was attracted to these fabrics because of the woven patterning. Small-scale patterns were created with simple color and weave sequences. The warp was designed with a specific color order and that same color order was repeated in the weft, creating imaginative and beautiful patterns on a simple two-shaft loom. The creativity of the weaver was evident. I believed that these patterns would translate well into cross dye fabrics and wanted to spend some time studying them.
I returned to the Jinze Art Center in 2015 to participate in a residency. My research consisted of analyzing many of these patterned fabrics that were made in the Nantong region of China. Many of the patterns were familiar, as they are part of a weaver’s vocabulary but I found them combined in new and refreshing ways. The Chinese names for these patterns reflected the local Chinese culture; a pattern we would refer to in North America as “log cabin” was called “reed mat” or “fly legs”. I studied these fabrics with the idea of using them as a foundation for my own woven shibori cross-dyed textiles, and wove the patterns on old Chinese looms.
While at Jinze I worked with several young Chinese hand weavers. These young artisans have been recently introduced to the craft of hand weaving as a creative endeavor. They are interested in their local handcraft traditions and are collecting pieces of old tubu cloth but had no idea that the cloth patterns could be de-constructed and analyzed from a technical perspective. We reproduced some of these patterns on modern handlooms.

The tubu fabrics are a source of inspiration and are finding their way into my own textile work. They have become a basis for working with multiple fiber constructions and cross dyeing as I continue the exploration of weaving and natural dye.