**Feeling a Little Blue (Green): Effort to Reduce Staining on a Flood Damaged Zuni Textile**

National Museum of the American Indian

**Introduction:** In 2011 and 2012 A Cargill grant made it possible for the National Museum of the American Indian (NMAI) conservators and fellows to conduct a place-based education program with Pueblo and Navajo communities in the Southwest. During both visits, the team met Zuni master potters, Milford and Randy Nahohai. As the Nahohai family shared their process of creating pottery, an ongoing relationship of friendship and trust developed. In 2012 the Nahohai family asked the visiting conservators if they would examine and consider attempting to reduce or remove stains on a flood damaged family textile. This was an opportunity for NMAI to do a favor in-kind, giving back to the community. In 2013 as a new Mellon Fellow, I was entrusted with the care and treatment of their textile, a meha. Mindful of the challenge it would be, and conscience of the weight, responsibility, and honor caring for this family heirloom held, many treatment options were carefully pursued. This poster examines the processes and techniques used in the effort to reduce discoloration and staining due to the migration of dyes from colored wool embroidery yarns onto a white cotton ground.

**Application of the Discharge Paste:**

Discharge paste contains ammonia 3%, urea 5% and a reducing agent, and sodium carbonate (also known as basic solution). DeColourant is Sodium Hydroxymethanesulfinate (NaOCH3SO3H), a dye stripper that works by breaking down dyes. Discharge paste is used to break down dyes on cellulosic fibers and tested with solvents in agarose gel, and by direct application to the fabric. It was hoped that agenese would be a mechanism for wet cleaning without full immersion.

**Result:** A mixture of 50:50 ethanol and DI water was the most effective. The next stage was testing the staining on the meha.

**Final Rinse:** The embrodiered sections and tassels were elevated on ethafoam blocks, and sprinkler attachment, the conductivity fluctuated from approx. 35 to 65 (just the nature of drying, and pull additional fugitive dye away from the ground cloth. The purple-red dye was successfully reduced, but the blue-green staining did not respond to elevated water temperatures.

**Application of the Discharge Paste:** The embroidered edges were protected with high-density polyethylene. The discharge paste was applied with a spouncer. The 25:75 mixture was applied in the center, and the 25:75 mixture feathered on the perimeter to blend and soften the effect.

**Research of Dyeliterture:** One industrial technique for the removal of fugitive dye suggests boiling the textile. TDO HAMSA, however water between 65°C and 85°C were used to move water and released dye.

**Cytodissolve** was considered for use as a neost while applying water to the purple-red staining found in the corners. Ultimately, the method was rejected due to lack of results for complete sublimation from the thick textile, and water temperatures would exceed its melting point of 58°C to 61°C.

Drying cloths were used. Soft brushes were used for taping down the cloths to a firm and optimal contact during drying, and pull additional fugitive dye away from the ground cloth.

**Puzzle:** Acid dyes for protein fibers release/reverse under basic conditions, and basic dyes for cellulosic fibers release in acid conditions. Conditions, which remove dye from one element of the textile, may fix it to the other.

**Dye Identification Following Dr. Helmut Schwag’s preliminary test, concentrated sulfuric acid was added to black wool fibers. The solution turned black-green, water was added and a green-blue precipitate formed. Indicating the dye may be CI Acid Black 1 (Amido Black 10B).

**Dye Extraction:** Small black and green samples of embroidery yarn (tails from the reverse) were removed. Could the dyes be made to run? The yarn samples were heated in solutions of "9%" buffering solution (tri/hydroxymethylaminomethane), pH of 9, and citric acid (pH-6) chelators were also tested and had no effect on the blue-green staining. The one percent gel matrix open.

**Puzzled:** Acid dyes for protein fibers release/reverse under basic conditions, and basic dyes for cellulosic fibers release in acid conditions. Conditions, which remove dye from one element of the textile, may fix it to the other.

**Additional solvents:** 4% Apargeo gel and EIDA pH 8 4% apargeo gel 0.5% citric acid pH 12.0 Acetic acid pH 2.5

**No effect on stain**

**Additional solvents**

**Research of Dye Literature:**

This early synthetic azoic dye does not have good wet fastness. Formed indicating the dye may be CI Acid Black 1 (Amido Black 10B).

**Dye identification**

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**Dye synthesis:** Notches on synthetic fibers would be colored by the dye, cellulose would take up dye and result in a stable color.

**Application of the Discharge Paste**

A sample of aged cotton yarn was placed in the alkaline black dye bath to see if the cellulose would take up dye colored by the dye, it was.

**Research of Discharge Paste**

Discharge paste contains ammonia 3%, urea 5% and water 70%. Each end of the dyed yarn was painted with one of the products, and both appear to reduce the dye. However, after rinsing the discharge paste from the fabric, the pH was neutral.

**Initial Investigation of Aqueous Solvents:** Nonpolar solvents had no effect on the dyes found on the cotton ground. It was presumed acid dyes from wool embroidery yarns migrated to the cotton. Muslin was stained with 0.2% lanaset dye (for protein fibers) and tested with solvents in agarose gel, and by direct application to the fabric. It was hoped that agenese would be a mechanism for wet cleaning without full immersion.

**Test:** A mixture of 50:50 Ethanol and DI water was the most effective. The next stage was testing the staining on the meha.

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**Visit to the International Dry-cleaning and Laundry Institute:** Brian Johnson and Susan Headl at the International Dry-cleaning and Laundry institute, where a "steam gun" and "spitting board" supplied higher temperatures and controlled dyestuffs for green-blue stain reduction. The steam did not reduce the green-blue staining as hoped to any significant degree, and the steam and suction were forceful, extended exposure might damage the handwoven textile.

**Recommendation:** Discharge paste was the best approach for the meha.

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**Application of the Discharge Paste**

The embroidered sections and tassels were elevated on ethafoam blocks, and sprinkler attachment, the conductivity fluctuated from approx. 35 to 65 (just the nature of drying, and pull additional fugitive dye away from the ground cloth.

**Drying:** For 20 minutes, 100% moisture was maintained. After rolling the meha into towels, 95% moisture was maintained for 20 minutes to remove moisture.

**Dye Extraction**

Small black and green samples of embroidery yarn (tails from the reverse) were removed. Could the dyes be made to run? The yarn samples were heated in solutions of "9%" buffering solution (tri/hydroxymethylaminomethane), pH of 9, and citric acid (pH-6) chelators were also tested and had no effect on the blue-green staining. The one percent gel matrix open.

**Puzzle:** Acid dyes for protein fibers release/reverse under basic conditions, and basic dyes for cellulosic fibers release in acid conditions. Conditions, which remove dye from one element of the textile, may fix it to the other.

**Final Rinse:** The embrodiered sections and tassels were elevated on ethafoam blocks, and covered with high-density polyethylene. A table covered with plastic sheeting was elevated at one end to allow water to freely run off. Warm DI water was delivered from a hose with a sprinkler attachment, the conductivity fluctuated from approx. 35 to 65 (just the nature of the mechanism). Napped paint rollers were used to move the water along the textile. This wet treatment lasted just a few minutes, enough to dissipate tidelines from discharge paste treatment. The meha was immediately rolled in towels to remove moisture.

Wicking cloths previously stitched to the perimeter of the embroidery remained in place for this wet cleaning, pulling fugitive dye and degradation products away from the ground textile during drying.

**Application of the Discharge Paste:** The embroidered edges were protected with high-density polyethylene. The discharge paste was applied with a spouncer. The 25:75 mixture was applied in the center, and the 25:75 mixture feathered on the perimeter to blend and soften the effect.

**A second application of the 25:75 was applied** to the bottom of the black and green portions of the textile.

**Author Biography**

Cathleen Zaret was an Andrew W. Mellon Fellow in Textile Conservation at the Smithsonian National Museum of the American Indian when this project was completed. November of 2013 she launched her private practice Zaret Textile & Costume Conservation LLC, and since then has been conserving and mounting three-dimensional and flat textiles for museums and private clients in Washington DC, Maryland, and Virginia.

**AIC Textile Specialty group PostPrints**


**Wolbers, R. Unpublished notes from cleaning and Laundry institute, where a "steam gun" and "spitting board" supplied higher temperatures and controlled dyestuffs for green-blue stain reduction. The steam did not reduce the green-blue staining as hoped to any significant degree, and the steam and suction were forceful, extended exposure might damage the handwoven textile.

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