Black Silk, Brown Silk: China and Beyond—Fabric Analysis

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A piece of unusual fabric that is shiny black on one side and red-brown on the other laid unidentified among the Chinese textiles in the University of Rhode Island (URI) Historic Textile and Costume Collection for over half a century. Abby Lillethun's interest in analyzing mud silks brought this cloth, identified as *Xiang-yun-shā,* from obscurity to notoriety. Its most obvious feature is the two-colored surfaces created by first dyeing the fabric and then coating one side with black mud as described in the preceding papers by Lillethun and Lin.

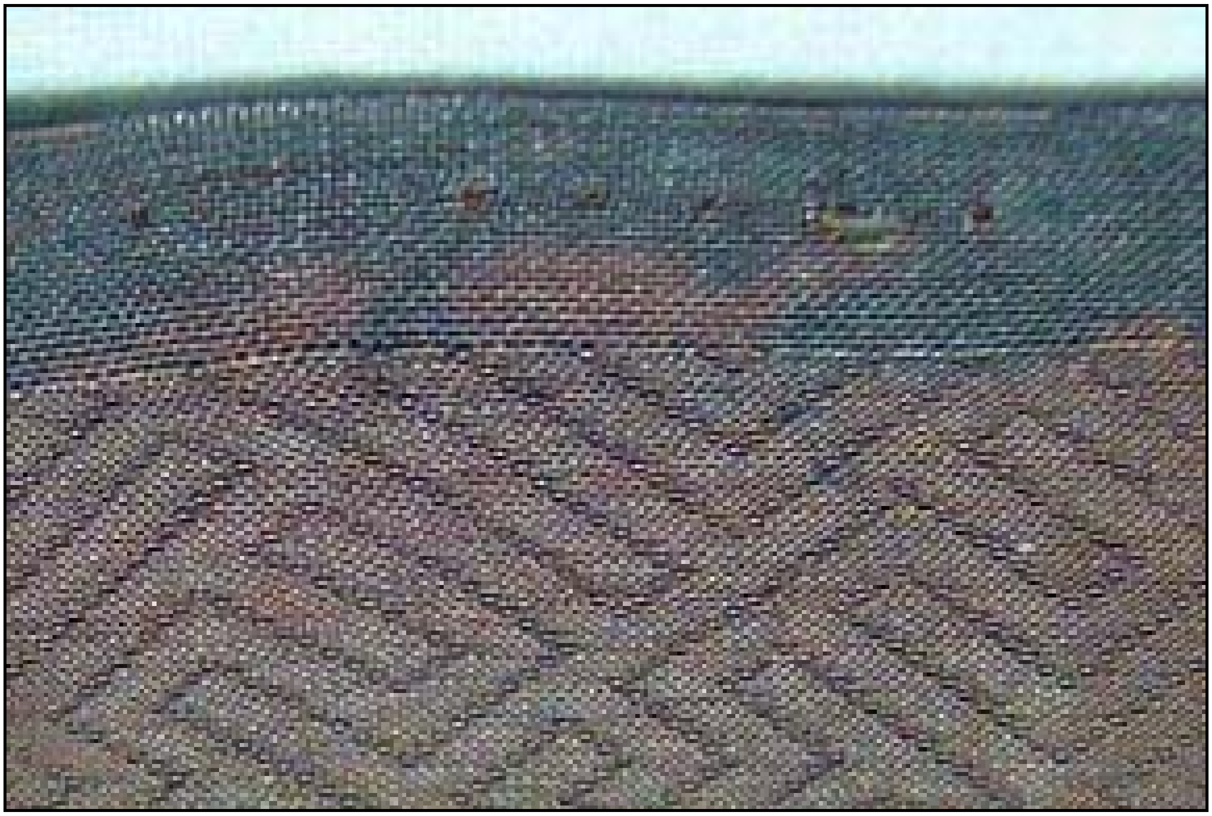
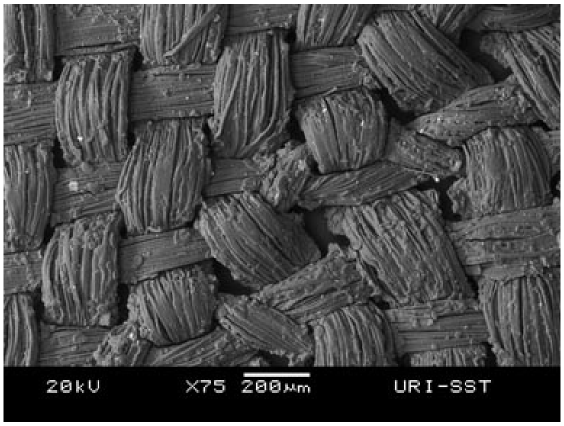


Figure 1. *Black mud deposits along back edge of leno-woven fabric (Xiang-yun-shā), URI Historic Textile and Costume Collection, photo by author.*

The selvage of the URI fabric, seen from the backside in figure 1, has some iron-rich mud along the edge and some stitching holes from a previous use. The geometric leno-weave pattern creates a key design with a little openness in the structure. The scanning electron microscope (SEM) photomicrograph in figure 2 shows some open spaces on either side of the diverted warps of the leno weave that run diagonally across the picture. This backside of the fabric has some mud deposits, but the black front side that is in figure 3 has a heavy coating of mud that covers the yarns completely. The treated fabric does not need to be beaten or calendared; the dried surface of the mud is quite shiny. The textile's hand is firm and somewhat stiff.



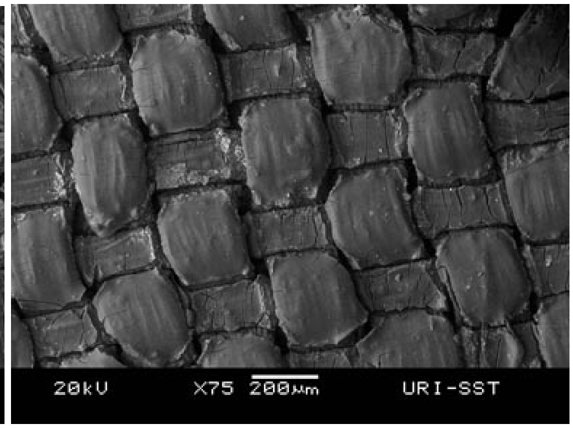
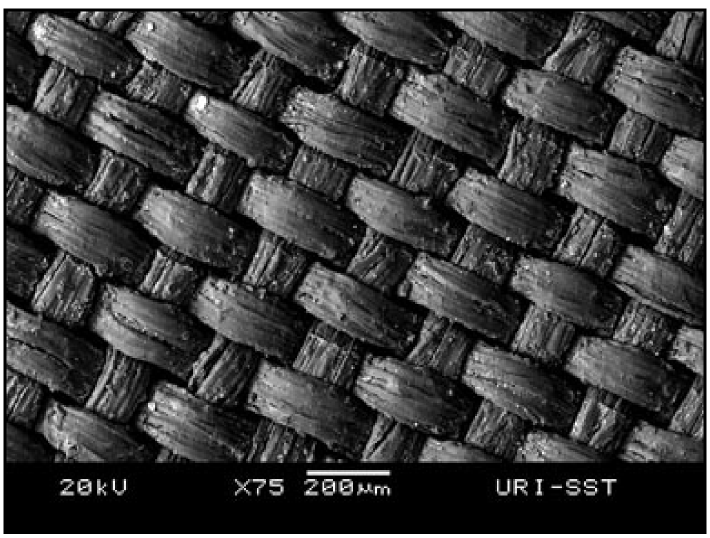


Figure 2 (left). *Magnified view of diverted warp yarns in leno weave.*
Figure 3 (right). *Mud coating on the silk yarns of the leno weave.*
Images--URI Historic Textile and Costume Collection, SEM photomicrograph by author

A similarly colored plain-weave fabric makes up a contemporary pair of pants designed with the black side facing out except at the waistband, which has the brown dyed side exposed (pictured in Lillethun article). This newer fabric, which is named *Jiāo-chou* and could be up to 80 years younger than the URI fabric, has a lighter deposit of mud (Fig. 4), but still has a crisp hand. The mud coating contains carbon, silicon, calcium, iron, and aluminum—not an unusual combination of materials for mud and the same composition as the other coatings analyzed for this report.



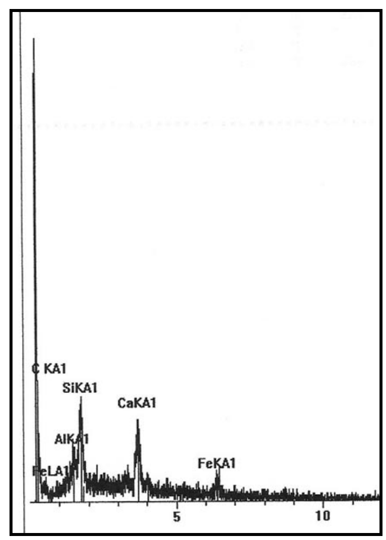


Figure 4 (left). *Mud coating on silk fabric (Jiāo-chou) in pair of contemporary pants, purchased by A. Lillethun, SEM photomicrograph by author.*

Figure 5 (right). *EDS spectra from elemental analysis of mud coating on pre-1932 pants, generated by author.*

The Electron Dispersive Spectroscopy (EDS) spectra in figure 5 from the mud on a pair of pants collected in 1932 has the same makeup (pictured in Lillethun article). This fabric, however, is very shiny, black on both sides, and is a 4/1 twill weave (Fig. 6). The mud deposit is not as heavy as on the URI fabric and coats individual filaments more than yarns. The coating on the filaments is more than just a thin surface layer as can be seen when the mud has been lost on some of the silk filaments in figure 7.

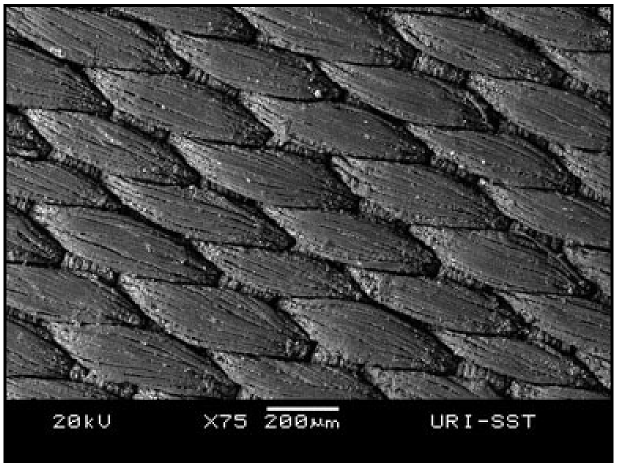


Figure 6. *Mud coating on silk fabric in pair of pre-1932 pants, purchased by A. Lillethun.*
Figure 7. *Breaks in the mud coating exposing bare silk filaments from pre-1932 pants, purchased by A. Lillethun.*
Images--SEM photomicrograph by author

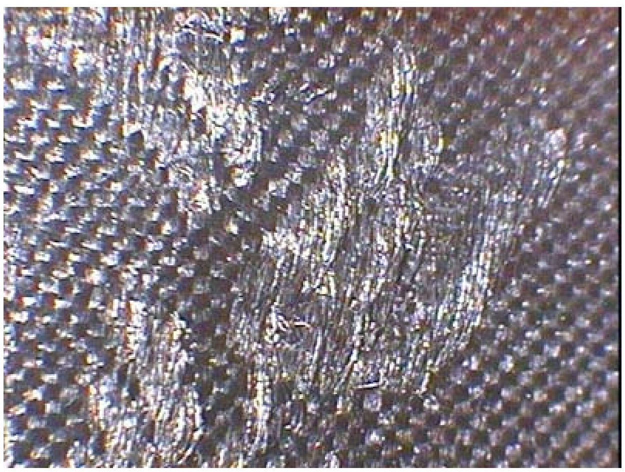
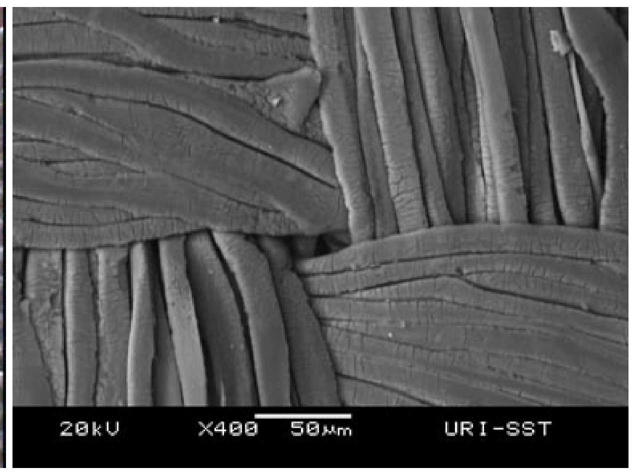



Figure 8. *Detail of drapeable mud-coated silk damask, purchased by A. Lillethun, photograph by author.*
Figure 9. *Mud coating on silk damask, purchased by A. Lillethun, SEM photomicrograph by author.*

Another shiny fabric, collected in 1932 and black on both sides, is a damask with warp-float designs (figure 8). Its almost slinky hand is quite different from the previously mentioned fabrics despite its mud coating (figure 9), which covers individual filaments more than entire yarns as on the URI leno weave in figure 3. The coating on the damask also is much more cracked than on the leno weave. These two factors may explain why the damask drapes well while the leno weave is stiff. This damask is the only one of the black fabrics that tested positive for indigo, which dyers use to help produce a deep black dye. In figure 10, the positive test for indigo shows blue (oxidized) indigo in the upper layer of ethyl acetate.

Figure 10. *Positive test for presence of indigo in dyed silk, photograph by author.*
Figure 11. *Drop of water on coated silk in a test of water repellency, URI Textile Conservation Laboratory, photograph by author.*

Sources refer to the mud-coated silk fabrics as being waterproof.[1] Figure 11 shows our test of water absorbency on the URI fabric. The very round drop of water was not absorbed into the fabric within the 30-minute test time, although the liquid does seep through the openings along the diverted warps of the leno-weave pattern. The mud makes a very water-resistant finish on all of the black-brown and all-black fabrics.

Figure 12. *Pattern in mud-treated leno-weave coat, Catalog number 70/2343, Courtesy of the Division of Anthropology, American Museum of Natural History, photograph by author.*

The American Museum of Natural History has a very unusual mud-treated leno-weave coat that is unlike any of the many mud-treated fabrics the panel owns or has viewed. A picture of the black open-weave-fabric coat is in Lillethun's article. Figure 12 shows a close-up view of the pattern. Instead of finding some variation in the weave that would produce the very Asian

[1] Verity Wilson, Chinese Textiles (London: V&A Publications, 2005), 91-93.

pattern, close examination showed that the cause of the motifs was quite different. Figure 13 reveals that the dark parts of the design were created by flattening rounded, mud-treated weft yarns, possibly with a block before the mud dries.

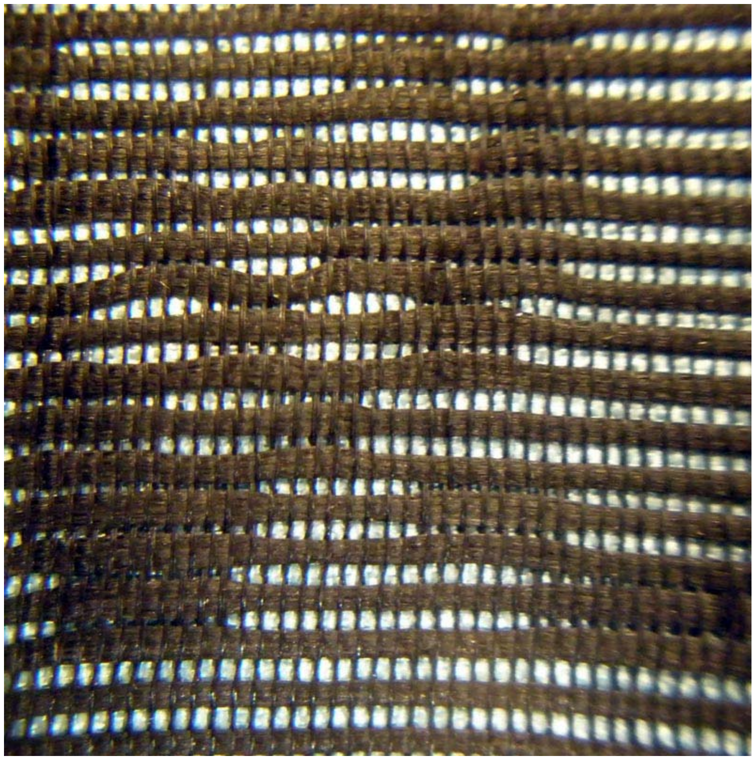


Figure 13. *Pattern created by flattening mud-treated weft yarns, Catalog number 70/2343, Courtesy of the Division of Anthropology, American Museum of Natural History, photograph by author.*

The Lin, Lillethun, and Ordoñez panel accomplished some of our goals. We wanted to increase the recognition of these mud-coated fabrics in contemporary fashions and in collections. Curators, collectors, and conservators need to know about them and consider safe handling, exhibition, and storage with as few folds as possible. We wanted to know more about the production of the fabrics and where they are produced, to examine some physical properties of these mud-covered cloths, and to confirm the presence of iron in the coating.

We found more than we expected as we discovered not just gambiered fabric—brown on one side and black on the other—but also coated fabrics that are black on both sides. The dye in one early twentieth-century fabric contained indigo. We examined not only leno-weave patterns, but also plain, twill, and figured weaves plus fabrics with high-twist crepe yarns and a wonderful embossed pattern on a leno weave.

Besides examples of garments for Asian wearers, we found a number of high-end garments before and during the TSA conference from designers in Asia, Europe, and the United States. Prices of the garments ran from around $100 to $3600. Limited production of the mud-coated fabrics may ensure that prices will stay high. Some designers are working directly with the producers who coat the fabrics.

However, we also have raised questions that inspire further investigation. Our oldest examples date to the early twentieth century, but diffuse attributions date the technique to the Tang Dynasty, 2000 years ago. Do other collections have older examples? Do travel accounts or trade records identify the fabric earlier than the past century? Most of our examples are coated silk, but we have read about and examined mud-treated cotton fabrics, too. How much mud finishing is done on cotton or other cellulosics such as ramie?

We examined the chemical composition of only four muds that contained carbon, silicon, calcium, aluminum, and iron in varying amounts. Could the constituents in the mud help identify its source or location of treatment? The fabrics that we studied were all hand woven. Is this also true of the new fabrics?

We have only begun to find out about who produced these fabrics in the past, the economics of these special cloths, and their wearers. If TSA members have information that could add to this study, we welcome input and encourage members to look for these fabrics in their collections.

Acknowledgments
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