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A Sizable Sooty Soiled Surface: Analyzing and Evaluating Methods for Surface Cleaning a Large Painted Muslin

ABSTRACT—Throughout documentation and treatment of a large, heavily soiled, late 19th century painted Lakota muslin for long-term exhibition, analytical methods helped to both characterize the object and evaluate the efficacy of the treatment. Pigments, binder, and stain composition were identified using microscopy, portable x-ray fluorescence spectroscopy, attenuated total reflectance Fourier transform infrared spectroscopy, micro-Fourier transform infrared spectroscopy, and x-ray diffraction. Additionally, paint colors were evaluated for light stability using microfade testing. Several sequential surface cleaning methods—vacuuming through Vellux, soot sponging, and localized ethanol spot cleaning—improved appearance and reduced lead surface contamination.

1. INTRODUCTION

The selection of a 16 × 6 ft. painted cotton Lakota muslin (NMAI 20/5176) for long-term display in the exhibition *Americans* at the National Museum of the American Indian (NMAI) in Washington, DC, afforded conservators an opportunity to research the painting materials, heavy surface soiling, and efficacy of treatment on this unique artwork during its preparation for exhibition. NMAI conservators relied on conservation scientists at the Smithsonian Institution's Museum Conservation Institute (MCI) for analytical techniques that could not be performed in-house. Treatment and analysis progressed simultaneously, and some analysis was still ongoing at the time of exhibition opening.

Americans highlights ways in which American Indians have been part of the identity of the United States since before the country began, surrounding visitors with images from advertising and popular culture, and delving into three stories – Pocahontas, the Trail of Tears, and the Battle of Little Bighorn. The exhibition website provides background for each section and features some exhibited objects from the collection (National Museum of the American Indian 2018), though not the painted muslin.

2. OBJECT BACKGROUND

2.1 CONSTRUCTION

The support is constructed of two commercially woven lengths of 35-in.-wide cotton fabric that are machine stitched along the object's horizontal center with a narrow seam. The short ends are turned and machine stitched to create a sleeve at either end. The figures are outlined in brown ink and colored red, yellow, blue, and green with a low binder-to-pigment ratio paint, some applied as a wash and some in a thicker, crustier application.

2.2 ICONOGRAPHY

According to one of the donor's letters in the museum archives, the painted figures depict a dog feast following the Battle of Little Bighorn. However, consultations with Plains drawing scholar Candace Greene and Lakota community members at Pine Ridge and Standing Rock suggest that this muslin does not depict a particular event but instead shows "aspects of Lakota life that situate warriors within an overall value system emphasizing compassion, generosity, and responsibility" (Ganteaume 2017). Details show what is likely a giveaway procession, references to a "making relations" ceremony, women cooking, and warriors in regalia—carefully rendered by the artist. Consultants found the piece to be unusual for its large size and for the number of women depicted (fig. 1).

2.3 OBJECT HISTORY

The muslin was painted by Strike-the-Kettle, or Ċeġaṗe, (Sihasapa [?] Lakota, dates unknown). He was a follower of Sitting Bull, the Lakota political and spiritual leader to the Cheyenne and Lakota warriors who defeated Custer and his soldiers at the 1876 Battle of Little Bighorn. Strike-the-Kettle was injured defending Sitting Bull when the latter was killed outside of his cabin in 1890 (McLaughlin 1891). Three years later, Sitting Bull's cabin, now owned by The Sitting Bull Log Cabin Company, was moved to Chicago for the 1893 World's Fair and featured as an attraction on the Midway where "the Indians are all genuine Sioux" (Department of the Interior 1893) and Indian curios were for sale. A firsthand account states, "The walls of the cabin were hung with robes and skins; upon which were painted representations of historic massacres, big hunts, etc." (Stevens 1895). The muslin, painted for non-Native consumption, may have hung in Sitting Bull's cabin on the Midway.

Museum accession records show that New York financier and railroad magnate H. B. Hollins purchased the muslin at the Chicago

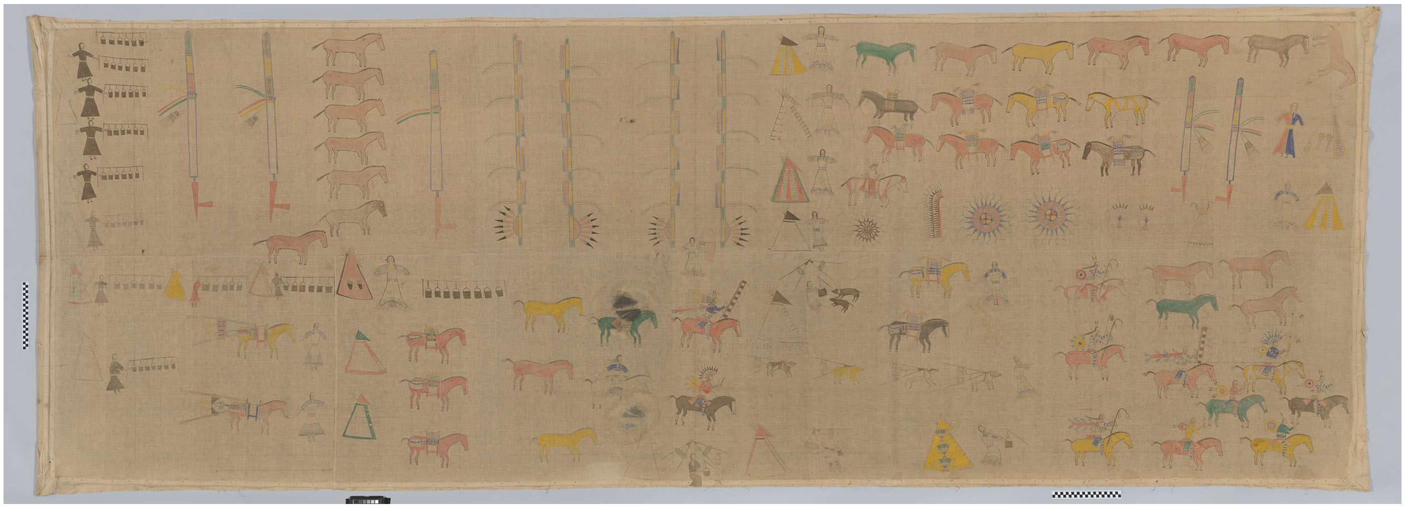

Fig. 1. Ċeġaṗe, or Strike the Kettle (Sihasapa [?] Lakota), untitled painted muslin, ca. 1890. Dimensions: 193 ¼" × 70"; 491 cm × 178 cm. (Courtesy of National Museum of the American Indian, Smithsonian Institution; NMAI 20/5176. Photo by Ernest Amoros.)

World's Fair in 1893. Hollins's son loaned the muslin to the NMAI's predecessor, the Museum of the American Indian Heye Foundation (MAI)[1] in 1942 after his father's death; the museum purchased the muslin in 1950. Addresses in the correspondence between Hollins's son and museum founder George Gustav Heye led authors to suspect that the muslin may have been displayed at the exclusive Knickerbocker gentlemen's club in Manhattan sometime between 1893 and 1942. In 1973, the Metropolitan Museum of Art featured the muslin in the three-month exhibition, *Masterworks from the Museum of the American Indian*.

2.4 TREATMENT HISTORY

Due to its large mounted size, the muslin must have been released from its stretcher and folded prior to its transport to the museum in 1942. At some point when folded in quarters to the horizontal midline, a viscous black substance dropped on the muslin and bled through all four layers; it is unknown if this happened before or after it arrived at the MAI. Black-and-white photographs from 1963 clearly show these black tar–like stains. Few MAI restoration and conservation records exist; fortunately, there was a 3 × 5 in. treatment card written by Phyllis Dillon, the museum's first conservator and advocate for preventive conservation from 1975 to 1981. The undated card describes efforts to remove the "rubber-like" stain with various solvents. Ethanol reduced the stain somewhat, but lateral spreading left a tideline and a cleaning halo, which are not seen in the 1963 photograph.

2.5 CONDITION

Structurally, the painted muslin was in good condition, with minor tears and holes. Pigments were stable, but the low binder-to-pigment ratio presented some risk of paint transfer. Surface issues included the following: substantial surface soiling from display in an urban and possibly smoke-filled environment; differential soiling along the stretcher bars and tacking margin, with rusty tack holes around the perimeter; tar-like stains at the lower center, with haloed tidelines from the previous cleaning campaign; overall acidic cellulosic discoloration; minor scattered staining; and creasing. See the annotated condition diagram in figure 2 for locations.

3. MATERIAL ANALYSIS

3.1 PAINT ANALYSIS

The muslin's long-term exhibition justified efforts to discover as much as possible about the painting materials. However, because of the museum's conservative sampling policy, conservators harvested small particles of paint that had been dislodged during surface cleaning for pigment and binder identification rather than sampling directly. This sample collection method meant that specific locations of paint samples on the muslin could not be determined. Authors Megan Doxsey-Whitfield and Nora Frankel performed polarizing light microscopy (PLM) and portable X-ray fluorescence (pXRF) testing, respectively, in-house; authors Gwénaëlle Kavich and Nicole Little of the Smithsonian's Museum Conservation Institute (MCI) performed attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), microscope-FTIR, and x-ray diffraction (XRD), respectively. For FTIR analysis, a Thermo Nicolet 6700 spectrometer equipped with an infrared (IR) light in the mid-IR region (frequencies between 4000–400 cm^{-1}) and an MTC-A detector was used. Spectra were collected for 64 scans at a resolution of 4 cm^{-1}. Samples were placed either on a Golden Gate ATR with diamond crystal for larger fragments (>500 μm), or flattened using a diamond compression cell before examination in transmission mode on a Continuum microscope for micro-FTIR analysis of microscopic samples. For XRD analysis, samples were exposed to a collimated beam of X-rays (100–800 μm) from a Copper Kα

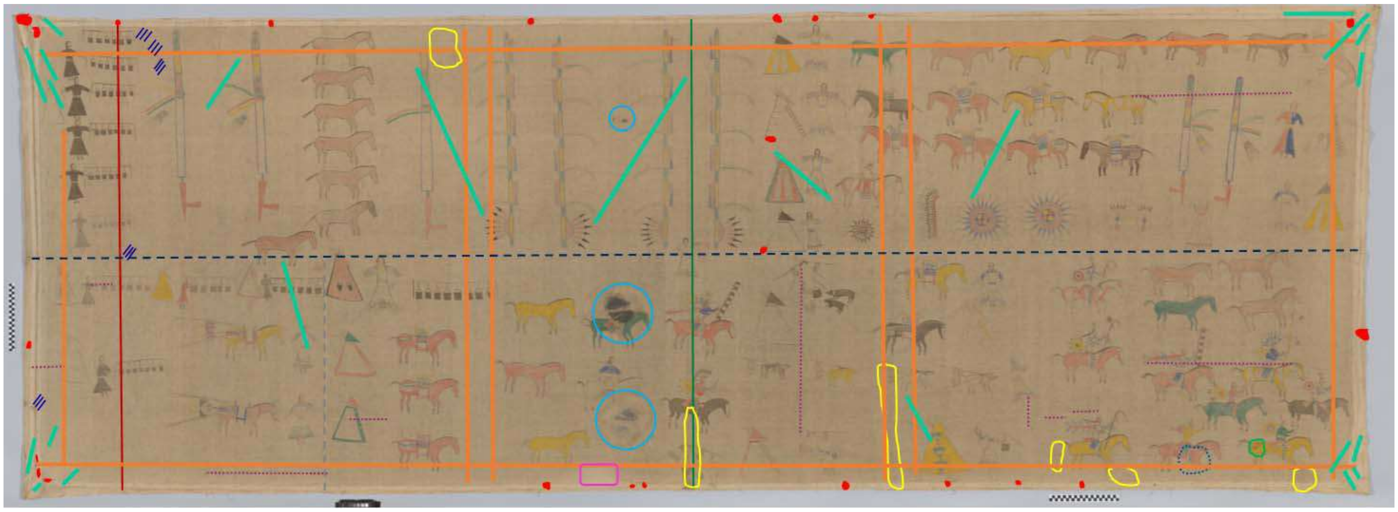

Fig. 2. Annotated condition image with locations of damage: stretcher bar marks (orange), black stain/cleaning haloes (blue), scattered staining (yellow), creasing (green), holes/tears (red).

tube source (50 kV; 40 mA; 2.00 kW), with diffraction patterns being collected on an image plate coated with phosphors.

3.1.1 Pigments

Though initial microscopy results were somewhat inconclusive, other analyses supported the following identification for the yellow, green, and blue pigments: chrome yellow, chrome green (a mixture of chrome yellow and Prussian blue), and ultramarine blue. The identity of the red pigments was not so apparent. Two different reds exist on the muslin: a truer red, often applied as a wash, and a bright orange-red, generally more thickly applied. XRF showed high levels of lead suggesting red lead, with some mercury—possibly vermilion. However, as the red pigment samples were not collected from known painted areas, it is difficult to directly correlate pXRF data with the other methods of analysis. FTIR and XRD results were inconclusive: the FTIR spectrum for the orange-red pigment contained a small amount of basic lead carbonate (lead white); red lead and vermilion are not identifiable through FTIR because their signals would be at smaller wave numbers (below 400 cm^1) on a standard FTIR spectrum in the mid-IR region. During PLM reexamination of the red pigment samples, optical characteristics—such as particle shape and size, Becke Line, and birefringence—were consistent with the presence of red lead and vermilion. However, "due to their small particle size, it is difficult to differentiate particles of red lead [and vermilion] from that of other pigments with an optical microscope" (Conservation and Art Materials Encyclopedia Online 2016).

3.1.2 Binder and Extenders

FTIR results showed a proteinaceous binder for all colors; complementary analyses are ongoing to further identify the protein source. All paint colors, except the blue, contained barium sulfate—a common pigment extender. Results are consistent with published technical studies on Plains painted art from the mid- to late 19th into the early 20th century (Moffat 1997; Pearlstein 2009). Plains artists commonly used the commercially available pigments chrome yellow, chrome green, Prussian blue, ultramarine, vermilion, and red lead with barium sulfate as an extender and a glue binder made from hide scrapings.

3.2 MICROFADE TESTING

Conservators originally suspected that some of the bright reds might contain organic pigments in addition to mineral pigments; however, Moffat's study (1997) found no evidence for use of organic pigments on Plains painted hide items until the late 1920s. With no rotation options for this one-of-a-kind muslin over a decade-long display period, author Thomas Lam of MCI performed micro-fade testing on accessible painted areas to determine how susceptible to fading the colorants were. Due to the size of the muslin and limited mobility of the instrument, only colors near the edge could be tested. Color change measurements were taken using the Oriel 80190 Fading Test System where a xenon light source imitating filtered sunlight (370–760 nm) actively fades a 2- to 3-mm spot up to delta E*ab of 2, which is just below what would be observable to the naked eye. The color change is measured with a spectrometer unit through a fiber-optic cable.

The graph summary in figure 3 shows that all colors of paint, except the yellow, changed color at a slower rate than the Blue Wool 2 Standard. The yellow paint was the most light-sensitive pigment, changing color more quickly than the Blue Wool 2 Standard but slower than the Blue Wool 1 Standard, which fades at twice the rate of the Blue Wool 2 and is the most light sensitive on the 8-step Blue Wool Standard card (CAMEO 2018). The yellow's delta L* and delta b* values decreased slightly, indicating darkening and a shift toward blue. Chrome yellow is known to

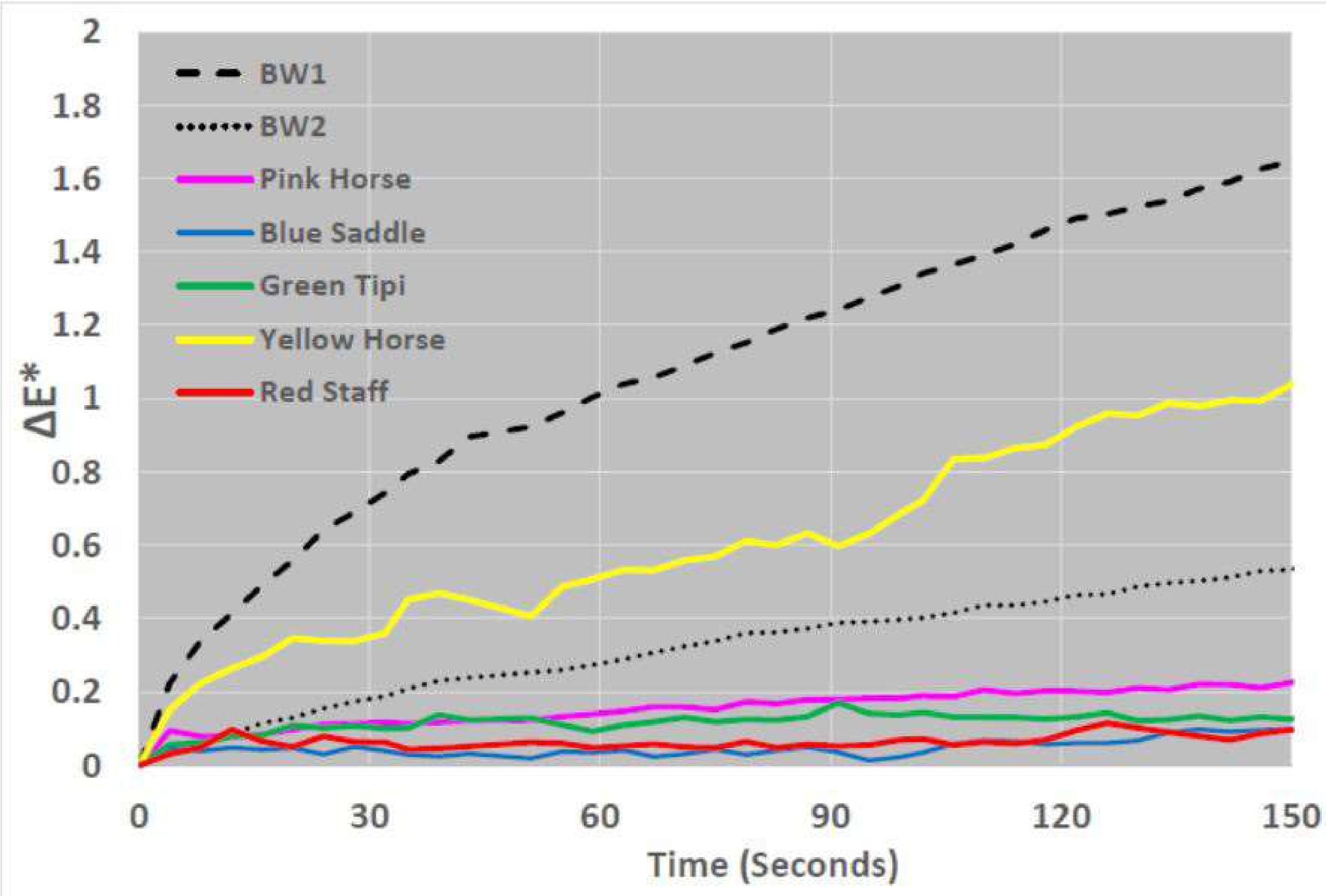

Fig. 3. Graph of micro-fade testing results of paint colors relative to Blue Wool Standards 1 and 2.

darken toward brown with exposure to visible and ultraviolet light (Kuhn and Curran 1986; thus, this color change would be attributable to this characteristic of chrome yellow pigments. Though the green pigment also contains chrome yellow, it exhibited a much smaller color shift because of its mixture with Prussian blue pigment.

3.3 SOILING AND STAINING

3.3.1 XRF Analysis of The Muslin

Given that the painted muslin had been displayed in Chicago and then New York for an extended period of time, conservators hoped to understand more about the composition of the soiling and the large black stains. Nora Frankel analyzed the elemental composition of the surface soiling and stains with a NITON handheld XRF XL3t in plastics mode on the unpainted portions of the muslin. The NMAI's pXRF protocol to test for inorganic pesticide residues on items to be repatriated was followed; six standards were used to calibrate the instrument and semi-quantitative results reported in parts per million (ppm).

Lead levels on the unpainted background were generally in the 20- to 65-ppm range; lead levels up to 120 ppm are characteristic of MAI collections items acquired ca. 1895 to 1985. Lead levels on the black tar–like stains measured in the 10,000- to 45,000-ppm range, while those within the cleaning tideline were around 300 ppm. The surprisingly high lead levels within the slightly tacky and malleable black stain piqued our curiosity about the stain composition and source.

3.3.2 FTIR Analysis of the Stain

A fragment of the black stain was analyzed with micro-FTIR. The spectrum contained calcite, lead carbonate, kaolinite, quartz, barium sulfate, possibly calcium sulfate, and traces of Prussian blue—the latter of which are paint-related compounds under the stain—in an oleo-resinous material. Though described as rubbery or tar-like in MAI/NMAI condition documents, the spectrum does not match rubber or coal tar. One possibility might be some formulation of mastic construction adhesive (CAMEO) containing fillers such as lead carbonate, kaolinite, and quartz inadvertently dropped on the folded muslin.

Fig. 4. Nora Frankel, Annaïck Keruzec, and Susan Heald vacuum the muslin with Vellux-covered micro-attachments. Courtesy of National Museum of the American Indian, Smithsonian Institution; NMAI 20/5176. Photo by Katherine Fogden.

4. SURFACE CLEANING TREATMENTS

Treatment goals were to reduce sooty soiling, lead contamination, and staining through surface cleaning methods while minimizing paint transfer or loss and to make painted images more readable for exhibition. During treatment, especially for surface cleaning, conservators wore lab coats, disposable gloves, and protective sleeves.

4.1 VACUUMING

The initial surface cleaning method was low-suction vacuuming using a variable speed Nilfisk with high-efficiency particle air (HEPA) filter. Vacuum attachments were covered with Vellux—a soft blanket fabric with a nylon-flocked surface on a polyurethane core (fig. 4). NMAI conservators originally learned of this material through conservator Linda Roundhill's postings on the Object Specialty Group Distlist, and often use Vellux for vacuuming basketry, beadwork, and textiles depending on their condition. The soft nylon flocking picks up particulates that can be visually evaluated with the naked eye or through a stereo microscope. Vellux should not be washed and reused or overused: too much mechanical action will compromise the fabric's structure, causing it to shed pile or bits of polyurethane foam onto the object. A recent publication by Tsang and Barnes (2017) discusses Vellux properties in detail and cleaning applications for acrylic paintings.

Vacuuming the reverse (unpainted side) first with four complete passes in both warp and weft direction removed a considerable amount of dirt, as seen in cross sections of the fresh Vellux compared to Vellux used during the first vacuum pass (fig. 5). Throughout the initial vacuuming with the painted surface face down, no paint transfer to the Tyvek-covered table was observed. Dislodged paint particles picked from the Vellux during this stage of vacuuming were used for paint analysis, as described in section 3.1.

The painted surface (front) was vacuumed through Vellux using micro attachments and working around painted figures. Again, a significant amount of dirt was removed, but there was little visual improvement.

4.2 SPONGE TESTING

In consultation with NMAI curators Cecile Ganteaume and Emil Her Many Horses, conservators decided to pursue additional

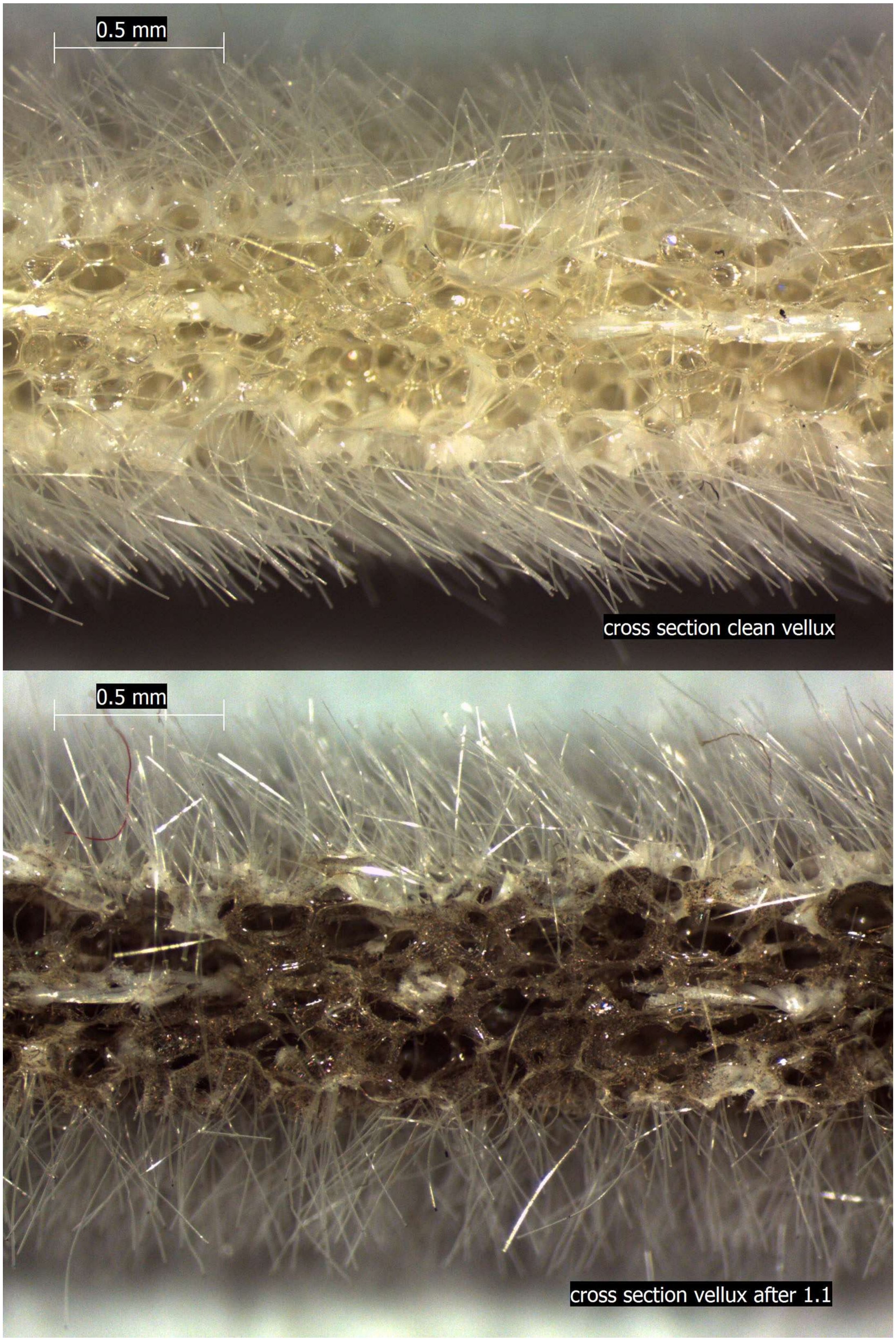

Fig. 5. Cross sections of the clean, unused Vellux compared to used Vellux from the first vacuum pass on reverse. (Photo by NMAI conservation.)

Fig. 6. Lower half after cleaning with soot sponges; Meghann Girard and Nora Frankel continue cleaning the upper edge. (Photo by NMAI conservation.)

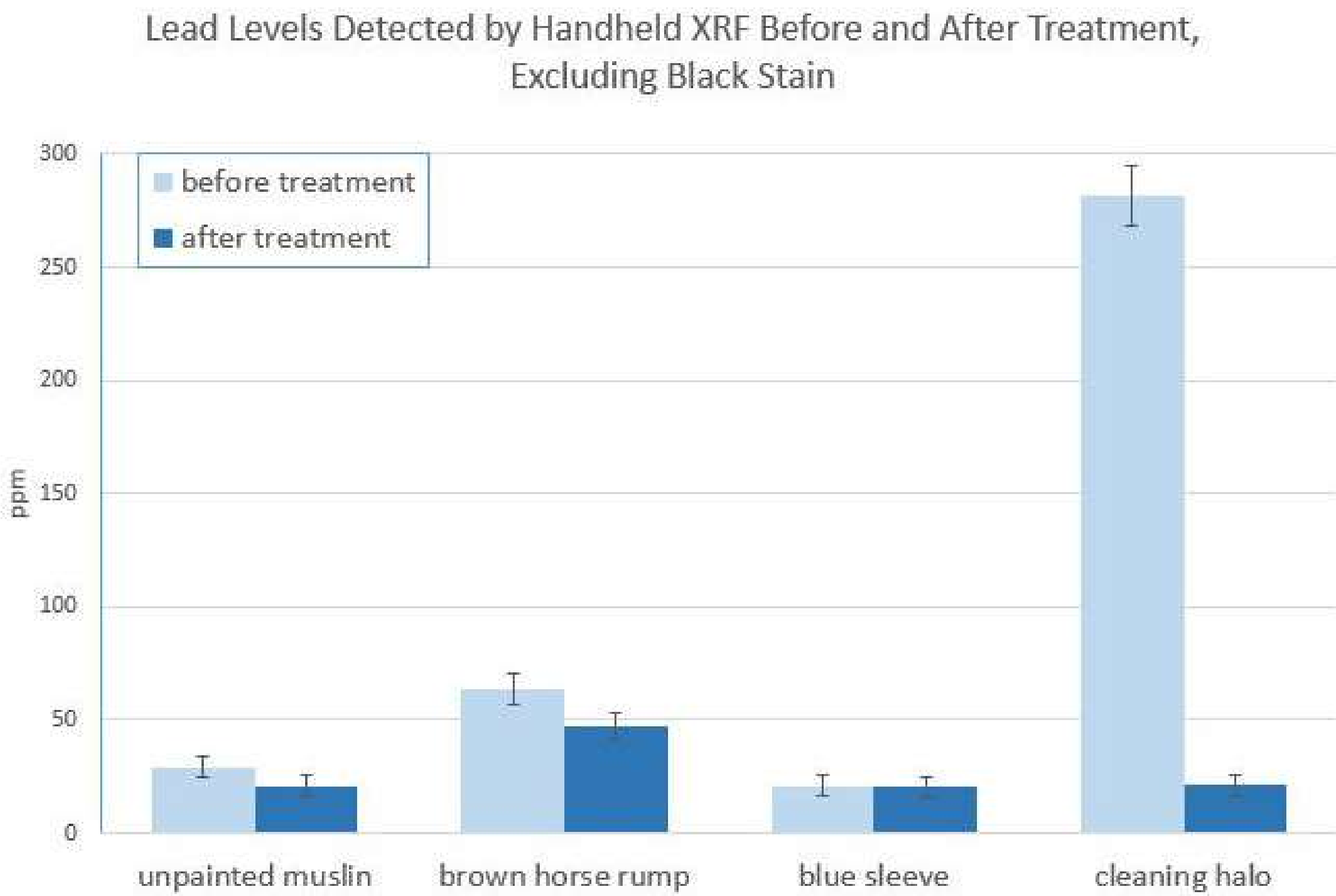

Fig. 7. Bar graph summarizing lead levels before and after treatment. Error bars indicate error as measured by Niton pXRF instrument.

mechanical surface cleaning after evaluating the efficacy and abrasion risk of several sponge materials. Four different sponge types readily available in the lab were evaluated: (1) polyurethane cosmetic sponges, (2) polyurethane ether foam, (3) polyurethane ester foam, and (4) rubber latex soot sponges. All tests were performed on the back of the muslin to minimize visual impact; susceptibility to pigment transfer was also evaluated. Surface and cross section examination of the sponge types tested indicated how each material removed and trapped soiling from the muslin.

4.2.1 Cosmetic Sponges

The polyurethane cosmetic sponges typically used in our lab did not pick up as much dirt as expected and left crumbs with the mechanical pressure needed for surface cleaning. The small size of the cosmetic sponges also meant that cleaning would not be time efficient over such a large surface.

4.2.2 Polyurethane Ether and Polyurethane Ester Foams

Because of its smoother structure, the ether foam was determined to be more appropriate than the ester foam. After testing an area with the ether foam, conservators noticed a considerable amount of pigment transfer to the Tyvek-covered table. The structure of the ether foam is rougher than the cosmetic or soot sponges and was more abrasive to the surface of the muslin. The ether and ester foams picked up the least amount of surface soiling compared to the other options.

4.2.3 Soot Sponge

Soot sponges are typically made from vulcanized cis-1,4-polyisoprene with calcium carbonate and trace oil as filler (Moffatt 1992). FTIR analysis of the NMAI's soot sponges (brand unknown) confirmed the presence of calcium carbonate and the spectrum shows peaks that may be attributed to natural rubber or polyisoprene. Though conservators had concerns that the tackiness of the soot sponge would pull up cotton fibers from the fabric and potentially leave residue on the object surface, the soot sponge demonstrated the best cleaning results with the least mechanical action and least pigment transfer to the Tyvek-covered table surface below. In their ATR-FTIR study of soot sponges, Digney-Peer and Arslanoglu (2013) showed that the amount of oily residue left behind depends on the exerted time and pressure as well as the surface characteristics of the object being treated. The rougher the

Fig. 8. Post-treatment collection of Vellux and soot sponges used in surface cleaning. (Photo by NMAI conservation.)

surface, the more residue left behind. In weighing the risks and benefits of cleaning with soot sponges, it was decided that reducing the lead-containing surface soiling was worth the risk of losing cotton fibers and potentially depositing a residue.

4.3 DRY CLEANING WITH SOOT SPONGES

Because of the paint transfer observed when test cleaning the back side, methodical sponge cleaning (two swipes in the weft direction followed by two swipes in the warp direction) was pursued only from the painted side, again working around painted images or gently blotting them if the paint was considered stable. Figure 6 shows the lower half after cleaning with soot sponges. Many hands shared this work and the results were quite pleasing. Color change measurements on the unpainted muslin surface with a Minolta CR-300 Chroma Meter showed a mean value delta E* of 4, mostly an increase in the L* value, or luminosity.

4.4 TIDELINE REDUCTION

Again, in consultation with curators, tideline reduction around the black stains was attempted using a suction platen and ethanol, which had proved somewhat successful in the 1970s stain reduction campaign. By applying ethanol with a syringe and rolling the surface with cotton swabs, then blotting with blotter paper followed by suction, the tideline edges were softened, although the visual change was minimal.

5. ANALYSIS OF CLEANING MATERIALS AND MUSLIN POST-TREATMENT

5.1 DART-MS

Following surface cleaning, MCI Physical Scientist Asher Newsome analyzed both clean (unused) and dirty (used) Vellux fabric and soot sponge samples using direct analysis real-time, high-resolution mass spectrometry (DART-MS). Of over 20 compounds identified, the most interesting was the presence of nicotine on the soiled Vellux and soot sponges, supporting authors' suspicion that the muslin may have spent years in the Knickerbocker Club with gentlemen tobacco smokers.

5.2 EFFICACY OF LEAD REMOVAL

Cleaned areas of the muslin were analyzed with the Niton pXRF to measure relative reduction of lead, while soiled Vellux, soot sponges, and used nitrile gloves were analyzed to measure relative transfer of lead to the cleaning materials.

Results are summarized in table 1 and in the bar graph in figure 7. The muslin has slightly lower lead levels in areas that were vacuumed and cleaned with soot sponges. Areas painted with ultramarine blue were used as a control for lead levels, as this pigment was the only one that did not contain lead and was not directly surface cleaned due to its friable nature; these blue areas showed no measured reduction in surface lead following cleaning. The tideline areas cleaned with ethanol and the suction platen showed a significant reduction in lead. In general, pXRF results show that all lead levels measured on the muslin after cleaning were below 50 ppm with the exception of the lead-containing yellow, green, and red pigments and the black stains.

No lead was detected on the used nitrile gloves. However, lead levels in the used Vellux were in the 160- to 210-ppm range, while used soot sponge samples were in the 1300- to 2500-ppm range. While some of this lead may be attributed to dislodged paint particles on unpainted surfaces, it demonstrates the efficacy of the soot sponge dry-cleaning method over vacuuming. Figure 8 shows the volume of used Vellux and soot sponges following the treatment.

Table 1. Effect of Cleaning Methods on Lead Levels

	Before Treatment		After Treatment		
Location	ppm	Error	ppm	Error	Treatment
Unpainted muslin	29.28	4.91	20.93	4.35	vac, SS
Brown ink	63.63	6.54	47.13	5.95	vac, SS
Blue pigment	21.07	4.37	20.25	4.44	none
Black stain	46051.31	1268.52	46915	1296.31	vac, SS, sol
Stain transfer	9782.6	157.09	10437.95	167.85	vac, SS, sol
Cleaning halo	281.29	13.19	21.2	4.54	vac, SS, sol

Note: Surface cleaning with vacuum (vac) and soot sponge (SS) resulted in moderate reductions of lead levels, while solvent cleaning (sol) drastically reduced levels in stain transfer and cleaning halo areas.

6. DISCUSSION

6.1 US STANDARDS FOR LEAD LEVELS

To put these lead levels in context, the Agency for Toxic Substances and Disease Registry's (ATSDR) report (2017) lists general soil levels at about 50 ppm, while urban soil often exceeds 200 ppm. The Environmental Protection Agency (EPA) standard for bare soil playground areas is 400 ppm, while the non-play area standard is 1200 ppm (EPA 2001). Therefore, lead values for the cleaned muslin are within the range of general soil, used Vellux is in the range for urban soil, and the used soot sponges surpass the range of the EPA standard for non-play area soil.

But at what levels do used dry-cleaning materials become hazardous waste? The NMAI's industrial hygienist Kim Harmon provided some helpful information: government agencies such as Housing and Urban Development (HUD), EPA, and the Occupational Safety and Health Administration (OSHA) all have lead standards. HUD and EPA regulations cover housing, childhood exposure, and environmental issues; OSHA's standards cover airborne exposure through inhalation or elevated lead in blood through ingestion. EPA uses a toxicity characteristic leaching procedure (TCLP) to quantify whether an item qualifies as hazardous waste; if the leaching solution (in 1:20 ratio with the solid waste) is greater than or equal to 5 mg/L, or ppm, it would qualify as hazardous waste (EPA 2016). Because tests like this are costly, the Smithsonian policy recommends that if one suspects that waste contains lead, treat it as hazardous waste and dispose of it as such, appropriately labeled.

6.2 DIRTY BIRDS IN CHICAGO

Returning to Chicago, where the muslin began its journey in the late 19th century, a recent study by the University of Chicago and the Field Museum measured atmospheric black carbon deposited on bird specimens collected in the Midwest from 1880 to 2015 using photometric reflectance data (DuBay and Fuldner 2017). They found that black carbon levels peaked in the first decade of the 20th century and that a large drop in atmospheric carbon in the mid-20th century corresponded to policies supporting coal-burning efficiency, fuel transitions, and environmental regulations. This study demonstrates the research potential in dirty museum collections. It would be interesting to study the elemental composition of the soil on some of these birds and compare it to the urban soiling seen on the muslin.

7. CONCLUSIONS

The treatment and analysis of the painted muslin was a time-consuming endeavor that used the resources of many people and provided much information over the course of its preparation for exhibition. Painting materials were identified or characterized, as were the staining and soiling materials. Conservators gained a better understanding of the efficacy of surface-cleaning techniques commonly employed in the lab, especially with regard to lead-contaminated surface soiling, which is common on older objects in the collection. Some paint particles and cotton fibers were removed during treatment, an unavoidable consequence of this type of surface cleaning. In this case, NMAI conservators and curators felt that the losses were acceptable to reduce the overall lead levels and have the muslin appear cleaner and brighter for exhibition. The increased contrast between the background and the painted figures makes the scenes more readable and available to additional interpretation by Native and non-Native museum visitors.

On display in the exhibit *Americans*, the muslin rests on a steep slant board inside a wall case with a single sheet of Optium Acrylic glazing. Because of the sensitivity of the pigments and the long-term exhibition, conservators and the exhibition designers consulted with lighting designer Anita Jorgensen to determine the optimal lighting scenario within the exhibition constraints. LED fiber-optic lighting with an external illuminator and two types of in-case fiber-optic rods provide 3- to 4-foot candles over the object surface. The lighting color temperature is 3100° Kelvin, and the color-rendering index (CRI) averaged over 15 colors is 97 (out of 100).

News outlets enthusiastically received the exhibition following the opening. One of the author's favorite reviews in *The New Yorker* magazine wishes that *all* Americans could see this exhibit (Schjeldahl 2018). Though conservators may wish for a shorter display period, it is likely that the run of the exhibition will be extended because of the exhibition's power to engage visitors and encourage them to reconsider what they know about Native America from schoolbooks, advertising, and popular culture.

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- Lighting Design: Anita Jorgensen

END NOTE

1. The Museum of the American Indian (MAI) became the National Museum of the American Indian (NMAI) when the collection was transferred to the Smithsonian Institution in 1989. The collection was moved from New York City to the Washington, DC area between 1999 and 2004. The NMAI maintains exhibition galleries in both New York and Washington.

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