7. Materiales de Conservación

Ethafoam® puede ser comprado en Maximu's embalagens especiais. R. Santa Madalena, 254 - Jd. Planteucal, Ribeirão Pires – SP, Brasil. Tel: (11) 4824-6500. http://www.maximusembalagens.com.br/

Poliéster 50 micras y Tyvek® 55g/m² pueden ser comprados en Molducenter Comercial Ltda. R. Adalberto de Matos, 61 - Vila Prel, São Paulo – SP, Brasil. (11) 5510-5511. http://www.lojamolducenter.com.br/

Polyfelt® branco puede ser comprado en Stephen Schafer (representación de University Products en Brasil). Alto da Boa Vista – São Paulo – SP, Brasil. (11) 3816-0489 / (11) 98366-0230. stephan@stephan-schaefer.com / http://stephan-schafer.com/

Hay materiales similares (conocidos también como "manta acrílica") disponibles en tiendas locales de tejido.

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ARTICLE

MICROFADE TESTING OF PLAINS INDIAN SHIRTS

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Thomas Lam, Smithsonian Museum Conservation Institute, Physical Scientist.

Project Overview

The light sensitivity of individual materials of composite objects have been for the most part unmeasured. As a result, most conservators traditionally have assumed that some of the materials in these objects have high sensitivity to light and have used the recommended light levels for sensitive materials. The Smithsonian National Museum of the American Indian (NMAI) conservation is preparing Lakota and Cheyenne shirts for display in the upcoming exhibition '*Americans'*, opening in October 2017 and is working closely with exhibition designers to best meet the needs of the objects regarding climate conditions and light levels. The *'Americans'* exhibit is planned to be on display for 10 years, hence an informed decision about the light levels for this exhibition is critical.

The overarching goal of the present study was, therefore, to optimize the lighting conditions for this long-term display. Plains shirts, such as these Lakota and Cheyenne shirts, are frequently on demand for exhibitions and loans, thus are subject to high risk of light induced damages. The fading rates of the shirts' various materials (painted hide, hair, textile wrappings, glass beads, dyed wool, etc.) range from stable to fugitive. In addition, the effects of existing light damage due to long exhibition history present challenges for devising recommendations for light levels. Since there is limited published scientific data on lightfastness of ethnographic objects at this time, one major goal of the analytical efforts, was on understanding the utility of microfadeometry as a lightfastness measurement tool for three-dimensional objects.

The Lakota and Cheyenne shirts in the *'Americans'* exhibit, dating to the late 19th century, were objects of great power and represent vast accomplishments and acts of bravery. They were ceremonially manufactured by the most skilled and dedicated women of the tribe. The power of the shirts came from their adornments. Several of the shirts were decorated with bands of quillwork, made with quills from the North American porcupine (*Erethizon dorsatum*), The Hunkpapa Lakota (Sioux) shirt NMAI 12/0001 (shown in Figure 1) and the Tsethasetas (Cheyenne) shirt NMAI 14/2245 (shown in Figure 2) are decorated with extraordinary stripes of quillwork. Assuming that the dyed quills were the materials that were most vulnerable to light induced color change, these shirts were chosen for the lightfastness tests.

Figure 1 Hunkpapa Lakota (Sioux) shirt NMAI 12/0001

Figure 2 Tsethasetas (Cheyenne) shirt NMAI 14/2245

Through a collaborative project between the NMAI Conservation Department and the Smithsonian's Museum Conservation Institute (MCI), a series of lightfastness tests using a microfading tester (MFT) have been performed to improve the lighting recommendations for the display of the Lakota and Cheyenne shirts. The microfadeometry setup and testing being performed on a Lakota shirt are shown in Figure 3 and Figure 4, respectively. Preliminary microfadeometry testing was conducted on mock-up quillwork prepared by conservator and quillworker Nancy Fonicello during a workshop held at NMAI in November 2016. Quills used for the mock-ups were dyed with wolf moss (*Letharia vulpina*), yellow dock (*Rumex crispus*), cochineal (*Dactylopius coccus*) and Indigo (*Indigofera* spp.) (Figure 5). The substrate material for the quillwork was a brain-tanned leather that had been flattened with a heat spatula. Additionally, mockups of quill wrappings, a multifaceted decoration technique widely used on the Plains shirts, were also used in these tests since the material's curved surface was expected to provide challenges.

Figure 3 Microfadeometry set up at the Museum Conservation Institute.

Figure 4 Testing the Lakota shirt.

Figure 5 Mock up material left to right: unflattened yellow and red quills, quill wrapping, two stripes of flattened quillwork in different colors.

Analytical Methodology

Microfadeometry is a spectroscopy technique that measures the visible reflectance from wavelengths of 400 to 700 nm and calculates 1976 CIELAB color space values as specified by the International Commission on Illumination approximately every few seconds that allows for the assessment of fading the materials. It is an effective tool to assess the lightfastness of different colorants such as dyes or pigments to describe how resistant the materials are to change when exposed to light. The advantage of this technique is that it is considered a non-destructive test method because of the small size of the test spot (analytical spot is 2 mm - 3 mm and potential degradation spot is 0.2 - 0.4 mm).

Fading measurements were performed with the *Oriel 80190 Fading Test System* (Newport Oriel Corporation) in the regions of interest until color change (fading) of approximately 2 ΔE^* units have been measured, or up to 300 seconds (5 minutes) if a ΔE^* of 2 units was not obtained. ΔE^* represents a compiled color space of relative differences between for lightness being L^*, red/green for a^*, and yellow/blue for b^*. The summation of the difference of the L^*, a^* and b^* readings compared to the initial readings show the significance of the color change. A $\Delta E^* \approx 2.3$ units has been reported in the literature to be the just noticeable difference (JND), and values less than 2.3 would not be noticeable by the naked eye.

The light source is a xenon lamp that closely imitates natural sunlight (IR filtered) and is used to focus a spot of light onto the sample's surface. The visible reflected light from the spot is then collected by a fiber optic taken to the spectrometer unit and the data is captured using the CDI Spec 32 Data Acquisition Software.

The assessment of the relative kinetics of fading was performed by comparison of the material with different grades of blue wool standards (Light Fastness Standards ISO/BS SDL Atlas USA, Rock Hill). The JND for blue wool standards have been established and are classified into ASTM categories for lightfastness. The light source of the MFT can fade blue wool 1 and blue wool 2 efficiently. Blue wool 1 has very poor lightfastness, where the JND can be observed at 0.4 Megalux hours. Blue wool 2 still has poor lightfastness, but the JND is observed at 1.3 Megalux hours.

Results of Analysis

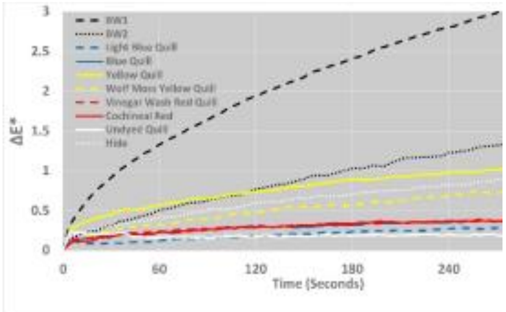

Figure 6 Reflective spectra of unflattened quills and hide on mock-up. BW1 and BW2 are respective abbreviations for blue wool 1 and blue wool 2 standards.

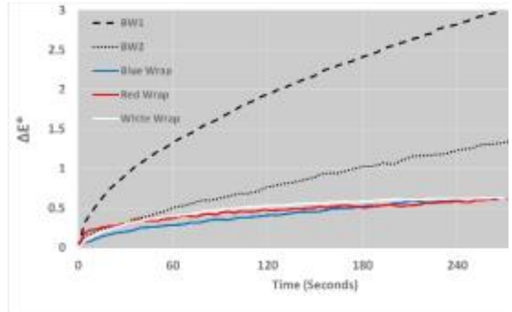

Figure 7 Reflective spectra of dyed quills on mock-up wrapping. BW1 and BW2 are respective abbreviations for blue wool 1 and blue wool 2 standards.

Preliminary testing

The testing of the mock-up material provides an opportunity to assess the material properties prior to the actual testing on the object. Specifically, comparing even and uneven object surfaces to define challenges in achieving the right height where the focused spot of light is obtained, which is essential for an adequate testing.

The flattened quillwork mock-ups were made from indigo dyed quills with high (dark blue) and low (lighter) color saturation, cochineal dyed and finished with and without a vinegar wash, quills dyed yellow with wolf moss and yellow dock, as well as undyed quills and the brain-tanned hide.

The measurement results of the flattened quillwork and the brain-tanned hide show that quills dyed with yellow dock were most light sensitive with a slower fading rate than a blue wool 2. The hide and the wolf moss dyed quills are similar light sensitive and faded at a slightly slower rate than a blue wool 2. The blue and red and undyed quills are relatively stable, which faded to a degree of less than Δ E* 0.5 units after 5 minutes of testing (shown in Figure 6).

Since the surface of the sample material needs to be relatively flat, non-flattened quillwork in comparison to the flattened material was tested to identify possible challenges. The test results of the non-flattened red quills dyed with cochineal show that the material faded at a slower rate than a blue wool 2. The yellow quills (dye unknown) on the other hand, are more light sensitive and their fading rate is more comparable to blue wool 2. Repeated measurements of both colors and found that the relative fading is about the same for each measurement, even though a slight difference in range was apparent (graphs not shown, but available upon request for the unflattened red and yellow). The test sample quill wrappings (test sample second to right as shown in Figure 5) were made with undyed quills, and with quills that were dyed with cochineal and indigo. It was found that the tested material has similar light sensitivities compared to measurements of the flattened quillwork and faded to approximately a Δ E* 0.5 units after 5 minutes (shown in Figure 7). Despite a more time-consuming process aligning the sample, focusing the spot of light, and dealing with a challenging curved surface, the results showed accurate measurements are obtainable.

Hunkpapa Lakota (Sioux) shirt NMAI 12/0001

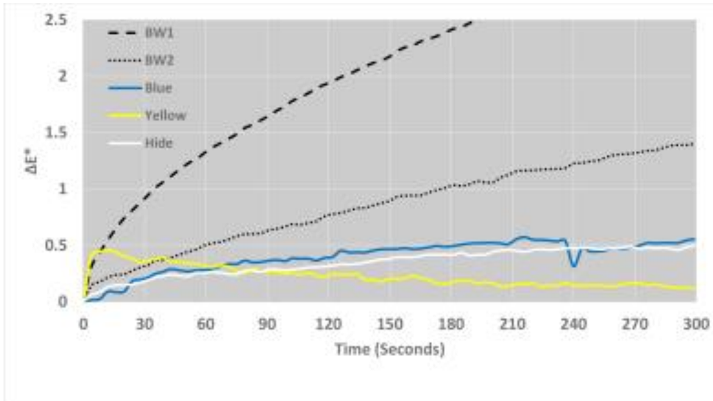

Figure 8 Reflective spectra of dyed quills and hide on shirt NMAI 12/0001. BW1 and BW2 are respective abbreviations for blue wool 1 and blue wool 2 standards.

The Lakota shirt (NMAI 12/0001) was created around the late 19th century and has a long exhibition history at NMAI. It is said it was owned by a member of Sitting Bull's band and then collected in 1890 by General William Passmore Carlin from North Dakota. Herbert W. Brown received the shirt from Carlin and it was then loaned by Herbert Brown to the Museum of American Indian (MAI) in 1923, and finally purchased from Brown in 1932.

Since the shirt was probably exposed to a high dose of light over its lifespan, its lightfastness was questioned, suggesting that most of the fading had already happened. Heavily faded areas are next to quillwork that remained with more intact colors, leading to a very irregular color appearance of the quillwork overall.

Testing the backside of the Lakota shirt, it was found that measurements of the red dyed quills couldn't be obtained. This has been documented issue at MCI, specifically for extremely primary reds. A primary red, meaning the reflected light is coming from wavelength above 550 nm, results in a near zero signal on the spectrometer unit of MFT for wavelengths below 550 nm. These near zero values can reach negative values and are dependent on the dark reference that was used for calibration at the beginning of each testing. If the dark reference is too dark, the wavelength values oscillate from slight positive to negative values in this range inducing noise in the calculated b* values − making the complied Δ E* fading results uninterpretable. A Labsphere certified reflectance standard SRS-02-10 was used in this study.

The blue and yellow quills as well as the hide show a slower fading rate than blue wool 2. A strong initial reaction of the yellow quill was noticed at the beginning of the measurement, followed by a reduction of color change, which leads to the assumption that this was caused by chemical reactions due to the higher energy of the focused light (shown in Figure 8). In this particular case, the microfade testing results would not be representative of exhibition lighting conditions.

Tsitsistas/Suhtai (Cheyenne) shirt NMAI 14/2245

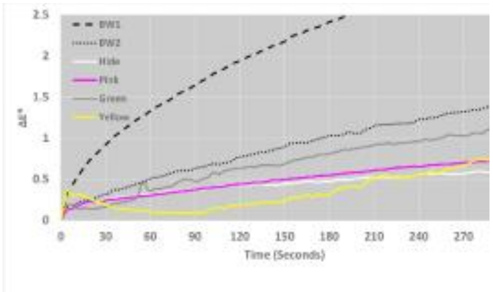

Figure 9 Reflective spectra of dyed quills and hide on NMAI 14/2245 front-side. BW1 and BW2 are respective abbreviations for blue wool 1 and blue wool 2 standards.

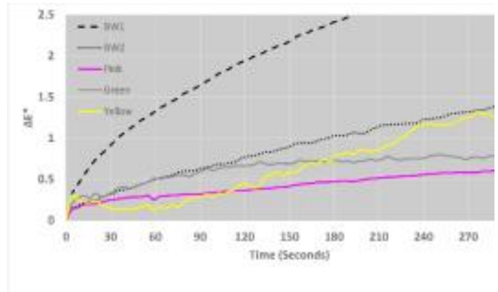

Figure 10 Reflective spectra of dyed quills on NMAI 14/2245 backside. BW1 and BW2 are respective abbreviations for blue wool 1 and blue wool 2 standards.

The Cheyenne shirt was also created around the late 19th century and stuns with its bright yellow quillwork.
Formerly in the collection of General Nelson A. Miles, the shirt was donated to MAI in 1925 by his children Cecelia Miles Reber and Major Sherman Miles.

The measurements of the green and pink quills as well as the hide at the front-side show similar fading results compared to the measurements of backside. It was determined that these materials faded at a slower rate than blue wool 2. Interestingly, the spectrum of the yellow quill looks very different when compared to the mock-up materials: an intense initial reaction, followed by a color recovery and then a rise in the ΔE^* value. Again presumably, the initial reaction is caused by chemical reactions due to the higher energy of the focused light and the microfade testing results would not be representative of exhibition lighting conditions (as shown in Figures 9 and 10). The data from the microfade testing also suggests the yellow dye used in the mock-up is not the same as the yellow dye in the object.

Conclusion

Despite the limitations on object repositioning and handling in these case studies, the lightfastness testing of three-dimensional objects was possible and allow for more informed decisions regarding lighting recommendations for the Plains shirts in the *Americans* exhibition.

The light sensitivity of all the tested materials faded at a rate slower than blue wool 2, even though the shirts were probably exposed to a significant light dose during their time at NMAI and even before. Nevertheless, with the test results in mind, we now feel comfortable to have the shirts on display for 5 years at 50 lux using an UV free LED lighting system and rotate the pieces. It was shown that microfade testing can be performed on quillwork, even though the material is not perfectly flat. However, patience is required when adjusting the height to produce a focused spot of light, which is the most difficult step when setting up the measurements. The microfade testing on three-dimensional objects can deliver valid data that will be useful for making informed decisions regarding lighting recommendations.

Project Participants

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ARTICLE

REOPENING OF THE WELTMUSEUM WIEN: TIME BETWEEN THE PAST AND THE FUTURE.

Renée Riedler and Luba Dovhun Nurse, on behalf of the conservation team, Weltmuseum Wien, Austria.

This short report discusses the ongoing project to create a new permanent exhibition at the Worldmuseum Vienna, formerly the Völkerkundemuseum*/Museum of Ethnology,* due to open in October 2017. The museum is part of the Kunsthistorische Museum. The project began in 2013 with the decision to create a new permanent exhibition. The deinstallation of the previous display began in 1997, in the interim the museum held temporary exhibitions and was actively loaning the collection to cultural institutions in Austria and abroad. Following an international open competition, Ralph Appelbaum Associates in collaboration with Hoskins Architects were appointed to redevelop exhibition and visitor facilities in the historic Neue Burg wing of the Hofburg Palace in Vienna.

The 7,500m² redevelopment includes 2,400m² permanent exhibition and 1,400m² temporary exhibition spaces. More than 3000 artefacts were selected to represent the collection. The permanent exhibition will be displayed in fourteen representative galleries, more information about the upcoming exhibition can be found on the museum's website:
https://www.weltmuseumwien.at/en/discover/about-the-museum/our-new-collections/.

The planning for the new exhibition began gradually while working on temporary exhibitions, loans and de-installation of the old galleries. A project on such a grand scale required a new approach from