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The Reveal: A Technical Study and Conservation Treatment of an Overpaint Portrait

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PATRICIA H. AND RICHARD E. GARMAN

ART CONSERVATION DEPARTMENT

BUFFALO STATE COLLEGE

The Reveal: A Technical Study and Conservation Treatment of an Overpainted Portrait

CNS 695 Master's Project

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ABSTRACT:

A severely damaged 19th-century oil painting depicting a portrait of a woman was treated at Patricia H. and Richard E. Garman Art Conservation Department. A typed letter provided by the owner mentioned that it has been previously restored yet returned with unsatisfactory results. After further examination, the painting appeared to have been previously treated multiple times by different people. There was overpaint distinctly present on the face and later discovered to be present overall. The full state of condition of the painting was initially unknown due to the sum of the surface being overpainted. However, there were evidence of paint loss and abrasions in areas where the overpaint was previously removed. The main goal of the treatment was to determine a suitable conservation method to safely remove/reduce the extensive overpaint without disturbing the original painting underneath. Scientific materials analysis including cross-section analysis, M-transmission Fourier transform infrared (FTIR) microscopy, and x-ray fluorescence (XRF) and multimodal imaging was used to identifying the materials present in the artwork, differentiate the original paint layers from overpaint and help guide the overpaint removal. Historical research was conducted to provide additional context surrounding the woman in the portrait. The treatment was successful and the artwork is now in stable structural condition and improved aesthetical condition.

1 INTRODUCTION:

The 19th century oil on canvas painting depicts as the title inscribes, a portrait of a woman. The painting is part of a private collection and was brought to the Patricia H. and Richard E. Garman Art Conservation Department for treatment in Fall 2019. While the artist and date were not known, the owner provided a letter regarding some background information and identification of the woman in the portrait. The letter mentions previous treatments and the history of how it came upon their possession.

The artwork was inherited by the owner's father in the 1960s after the death of their grand-aunt. They later inherited the painting after their mother's death. During the ownership of both the father and the current owner, the painting was taken to a restorer but returned with unsatisfactory results. The painting was then brought to additional conservators, where several cleaning tests were performed. The painting exhibited vast areas of overpaint, especially on the face. The tested areas revealed potential paint loss and abrasions underneath the overpaint. Upon further examination, two previously repaired tears were found on the sitter's right eye and thumb. There was no information regarding this treatment in the letter, suggesting that the painting has been treated before it was inherited by the owner's father.

Research was performed to find a suitable conservation method to safely remove the overpaint without disturbing the original painting underneath. Scientific material analysis assisted in differentiating the paint layers and identifying the materials used, to help find an apt method for overpaint removal. Further research of conservation case-studies regarding the subject aided in finding potential solutions to use for the treatment. Additionally, overall historical research gave context to the life of the woman in the portrait.

2 HISTORY AND BACKGROUND:

2.1 History of the Sitter and her Family

The information available about the woman in the portrait was limited. The letter provided by the owner indicated the woman in the painting was the owner's great-great-great-grandmother, known as Betsy Richards. Betsy lived in Northumberland County, in Northern Virginia, where she and her husband grew tobacco. Her husband, Thomas, served

in the Virginia legislature and was a major in the Virginia militia. In 1835, they moved to Saline County, Missouri, to land outside the village of Marshall, joining a number of other Virginia planters who moved to that region and bringing with them their entire household, including a number of children, dead relative's children, and slaves. They then traveled by boat to Pittsburgh. They carried the boats over the Appalachians to Ohio River, and from there floated their way to Missouri. In 1837, Thomas was elected Speaker of the House in the Missouri legislature, and in 1840, to the Missouri state senate. Beginning in the early 1840s, he served as Superintendent of Indians west of the Mississippi, based in St. Louis. The letter ends with a note by the owner stating:

> *"Although we have read some of the Major's correspondence with Congress in which he (Thomas) pleaded on behalf of Indian nations that were starving and being given pox-ridden blankets. I do not think of him or Betsy as heroes. They lacked the moral insight and courage to stand up against systems of oppression and in fact benefited from those systems. They are, however, part of history of my family and the history of this country.*" (Hoyt, 2019)

Betsy's full name is Elizabeth Edwards Harvey (Richards was the surname of Betsy's father). She was born in Virginia in 1799 and died in Missouri in 1853. She was Thomas Harvey's second wife and together they had three children: T.R.E., Theodore, and Jacquilin. Thomas was born in Northumberland County, Virginia, on February 20, 1799. He was educated in his native county and raised on a farm. He married his first wife, Miss Sallie C. Harding, in 1817, who later died shortly after their marriage. He later married Miss Elizabeth on January 13, 1820. They were married for 33 years until he perished on February 6, 1952, about one year before his wife. He spent his final years farming. Both now reside side by side in Carmel Cemetery located in Saline County, Missouri.

Figure 1: Thomas Harvey's grave in Mount Carmel Cemetery Fairville, Saline County, Missouri, USA.

2.2 Attribution

The artist is unknown. There was no signature visibly present in the artwork. However, a signature and date were found in the reverse using infrared imaging. This method and further findings will be discussed later in section *4.1.3 Infrared Imaging.* The signature and date were partially illegible. This may be the artist signature, though equally possible that the writing indicates the sitter (the first letter being a 'B') or perhaps something else altogether.

Figure 2: Detail of reflected infrared image of reverse of the painting. Possible Artist signature and date present.

2.3 Artistic style

Due to the history of the figure and her family is it probable the artwork is American. As seen in Figure 2, the painting has been dated around mid- 1840s. There was no confirmation that the signature present belongs to the artist. However, the date found on the artwork does coincide with Betsy's lifetime. During the 18th-19th century, American artists used European examples and traditions as influences in their artwork. By this time the country was still maturing, growing, and trying to find its identity. The main concern at the time was how to blend the sophistication of European art with native sensibility to establish an authentic and recognizable American school proclaiming the spiritual independence of the young nation:

> *"18th-century American painting comprised primarily portraiture, simple topographical art, and history scenes of the colonial wars and the revolution. As numerous American painters and sculptors traveled abroad to study the old masters, and academies and museums were created for the instruction of artists and public, the demand for new subjects grew. During the 19th century, topics essentially new to America – still life, genre, figure compositions, technology, natural history, and particularly romantic landscape – became extremely popular."* (Howat, 1970).

3 DESCRIPTION, MATERIALS, AND CONDITION

Figure 3: "*Portrait of a Woman*" with frame. Before Treatment

3.1 The Painting

This 19th century artwork (figure 3) "Portrait of a Woman" is an oil on canvas painting measuring 35 ½ x 29 ½, 2 3/8" in (H x W x D) with the frame. The painting depicts as the title indicates, a portrait of a woman wearing black clothing with embroidered sleeves, a white lace collar with a blue bow in the middle, and a short "white" veil. The woman is facing towards the viewer with only her right hand "resting" on the bottom. When first examined, the background was overall a mid-to-dark brown, though this was later found to be overpaint, along with many areas of her face and attire.

3.2 Condition

The painting arrived to the department in generally poor condition. Overpaint was visible on the face, and after further exploration and analysis, was confirmed to be overpainted throughout. The letter provided by the owner, indicates that the artwork was previously restored, but returned with unsatisfactory results. The painting afterward was taken to Westlake Conservators where they, with permission, conducted some cleaning/removal testing on 4 spots: the top, right side of the face, blue bow on the collar, and half of her hands. The full state of condition of the painting was unknown due to a sum of the surface being overpainted. The little areas that have been previously cleaned, showed a glimpse of the damage underneath. There was paint loss and abrasions.

Two tears have been previously repaired but not mentioned in the letter, indicating that it has been treated before the painting was inherited by the owner's father. The two tears were located one by her left eye and the other by her hand. On the reverse, there were two patches

from a previous tear repair treatment not mentioned in the letter. The varnish layer was discolored, darkening the image. The canvas, especially on the bottom, was undulated. The tacks were placed on top of the surface instead of the tacking edges. However, there were holes present on the edges, signifying that it was originally placed on the tacking edges and later moved on top in one of the previous treatments.

3.2.1 Support

Figure 4: Close-up of tacks on painting surface. Before Treatment.

The artwork is on a white primed, unlined canvas tacked to a wooden stretcher. The tacks were placed on top of the canvas instead of the tacking edges (Figure 4). Holes on the canvas edges suggest that the tacks were previously on the sides (Figure 7), but then later tacked on top. Additionally, the tacks present were not the original due to having a different size than the holes on the tacking edges. Overpaint was present overtop of the tacks, coinciding with the copious amounts of overpaint on the painting.

Figure 5: Close-up of tacks on painting surface. Before Treatment.

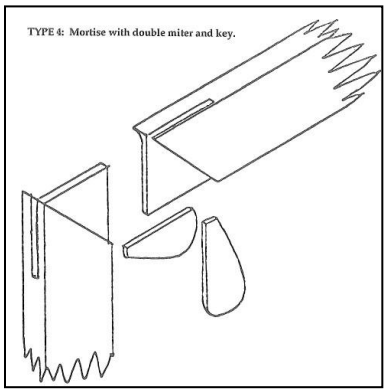


Figure 6: Mortar with double miter and keys joints diagram.

The stretcher consists of four wooden members with a Mortise with double miter and keys joints as depicted in Figure 6. (Katlan, 1992). There are 5 out of 8 keys present. The stretcher appears to be in structurally sound condition with scratches and abrasions throughout. “Woman X *checkmark*” is written in graphite on the bottom member. The stretcher was not believed to be the original due to multiple factors. Among them was the tacking edges being too thin on two sides (top and bottom) to properly be tacked (Figure 7c). Also, the paint seemed to extend on the thicker tacking edges (Figure 7a). Lastly, there were some holes on the stretcher that don’t match where the original tacking should have been located. It appeared that the painting was moved to a different stretcher and tacked on top since it did not have enough of a tacking margin to tack on the other two edges.

a.

b.

c.

Figure 7: Before Treatment. a. Left tacking margin with extended paint. b. Right tacking margin with masking tape. c. Bottom tacking margin with selvedge edge and original tacking holes. Upper tacking margin not included due to similarity to bottom tacking edge.

The primary support is an unlined, thin, plain weave canvas. The bottom of the canvas was undulated. The canvas has selvedge edges and white ground can be seen peeking through the weave. The tacking edges vary in length on each edge (as seen above). The right and upper right tacking margins were covered with masking tape and tacked (Figure 7b). The tape detached pieces of brittle canvas. Two cloth patches were found on the reverse of the canvas (Figure 12). A large rectangular patch (3" H x 7" L) with a loose upper right corner was found in the center of the canvas (behind the face) and a smaller patch (1" H x 2" L) was found in the bottom center of the canvas. A dark circular shape with an accumulation of an unknown substance on the edges is present on the reverse bottom right of the canvas. There was an accumulation of dirt and grime throughout the surface.

3.2.2 Ground/Paint Layers

The ground is thin and white and can be seen on the left tacking edge. The ground was also visible on the reverse of the canvas, where it was pressed through the open canvas weave during application. The ground could also be seen in areas of abrasions and damages.

Figure 8: Before Treatment. Detail of figure's eyes and previous cleaning test on the sitter's proper left eye.

The paint layers were thinly applied oil paint with little to no impasto. Drying cracks, common to aging, were spread throughout. There was loss of pigment on the thumb and index finger (bottom-center of the painting) and on the edge of her right eye (observer's left) where the two tears were present. A diagonal crease was found on the upper right corner and a curved crease was seen on her left shoulder. Insect secretions were found on her hand. There were areas with slight lifted/flaking paint, especially on the upper right corner. There were evidence of overpaint almost all over the original paint layer. Large amounts can be found on her face (as seen on left side of Figure 8), and most of the dark background. The uneven sheen and layer of dirt and grime throughout the artwork, make it hard to distinguish other potential areas of overpaint. There is a possibility of multiple paint loss underneath the overpaint.

The artwork was tested by previous conservator on four areas. The upper-center edge, the woman's upper-left side of her face (around the eye), her bow in the center, and on the bottom half of her hand. The test spot on her hand reveals the paint with the discolored varnish removed. The other three areas were believed to be locations where the overpaint was removed, revealing the original paint layer. Further testing determined if the overpaint was removed in upper-center test area or if it was result of overcleaning.

3.2.3 Varnish

The artwork had an unevenly shiny varnish layer. There were multiple areas with varying degrees of gloss. The varnish was likely a natural resin due to green fluorescence under ultraviolet illumination (Figure 14). Ultraviolet illumination also revealed the varnish being very loosely applied before framing. There were sections where the brushwork can be seen. However, it seemed like the varnish was loosely poured/applied and spread around with a brush or cloth to cover the whole surface. The varnish layer had significantly discolored over time. As mentioned above, the previous conservator removed the discolored varnish on the bottom half of her hand revealing the "original" paint color. The other areas where overpaint was potentially removed, still had some gloss. Except for the test on the bow where the surface was completely matte (Figure 13).

3.3 Previous Treatments

In the owner's letter (mentioned in section *1.1 History of the Sitter and her Family*), she also expands on the history of conservation of the painting. The owner states that her father, after inheriting them in the 1960s, took the portrait to a restorer in Washington D.C. They were dissatisfied after the portrait was overpainted by the restorer and changed the appearance of Betsy. After about ten years, the owner inherited the paintings and then taken to Westlake Conservators in Skaneateles, where they did an exploratory cleaning. The cleaning revealed the finer details in the portrait and demonstrated the degree of dirt and soot on the portrait. Westlake placed new backing boards on the painting.

Upon further examination, it was revealed that the painting had also gone through further treatment that was not previous stated. It was unknown if this happened around the same time as the "first" treatment with the overpaint or before the painting reached the owner's father in the 60s. On the reverse of the canvas, there were two patches which signify that the painting suffered two tears. Also, the tacks were placed on top instead of the tacking edges. There are holes on the tacking edges of the canvas, indicating that the tacks were previously on the edges but then removed and placed on top. It was unknown why the tacks were placed in a peculiar location.

4 IMAGING AND TECHNICAL ANALYSIS

4.1 Imaging Techniques and Results

The artwork was photographed before, during, and after treatment to document its condition and gather more information about the materials used. The imaging techniques used to photograph the painting include the following: normal illumination, raking, specular, ultraviolet, infrared radiation (reflected infrared (RIR)), infrared luminescence (IRLUM), and transmitted.

4.1.1 Normal, Raking, and Specular Illumination

The normal, raking, and specular images were illuminated with Profoto Tungsten lamps (EHC 500W/120v, 3200K). For the normal illumination image, two lamps were positioned evenly at a 45º angle on either side of the painting on the easel. For the raking image, one lamp was positioned to the left of the easel at an extremely oblique angle (10º), for the axial specular image two lights were situated on either side of the camera, pointing directly at the painting, and lastly for the oblique specular image the camera and the light were on opposite sides of the painting at a 45º angle. The images were taken with a Nikon D850 digital camera.

Figure 9: Before Treatment. Front. Artwork with frame.

Figure 10: Before Treatment. Reverse. Backing board attached to stretcher.

Figure 11: Before Treatment. Front.

Figure 12: Before Treatment. Reverse. Two tear-repair patches from previous treatment.

In normal illumination, the painting condition was captured as we see it (Figure 9-12). The four tested areas done by previous conservators were identified. Without the frame, the masking tape on the right and partial top tacking edges could be seen slightly extending into the paint layer. Also, the tacks on the surface were visible. On the reverse, evidence of previous tear-repair treatment was found. An oval composed of an unknown substance was also seen on the bottom right (Figure 12).

The raking light image revealed the surface topography, including the texture of the cracks. The canvas distortion was emphasized in the oblique specular image (Figure 13). This image also highlights the uneven sheen of the varnish including previous varnish removal test spots. The axial specular image exhibited similar results as the oblique specular.

Figure 13: Before Treatment. Oblique specular illumination

4.1.2 Ultraviolet Visible Fluorescence Imaging

UVA (Ultraviolet A-rays) is radiation that is in the region of the ultraviolet spectrum which extends from about 320 to 400 nm in wavelength. UVA imaging was conducted using two Wildfire Longthrow High Pressure Mercury lamps with IronArc 250W metal halide LMP-250D bulbs (peak at 365nm) that were positioned evenly at either side of the painting. The UVA-Visible-Infrared Radiation modified Nikon D810 camera was equipped with PECA 918 and Kodak Wratten 2E filters as well as the X-NITE CC1. The filters ensured that only visible fluorescence would be recorded by the camera, as the PECA 918 blocks IR wavelengths from being recorded and Kodak Wratten 2E filters block UV wavelengths.

Figure 14: Before Treatment. Front. UVA induced visible fluorescence image.

Figure 15: Before Treatment. Close-up of UVA induced visible fluorescence image. Dark grey border above greenish fluorescence identified as overpaint.

Under UVA the varnish fluoresces greenish indicating the varnish was a natural resin. There were clear brush marks throughout. The previously four tested areas were emphasized in this image since the final varnish layer has been removed, revealing the underneath painting which has different fluorescence. Under UVA, the application of the varnish could be seen. The top varnish seemed to be very loosely applied. It looked like the varnish was loosely poured/applied and spread around with a brush or cloth to cover the whole surface and then smoothed around the edges.

Overpaint was discernible in several areas of the painting, most prominently near the left eye (Figure 15) which appeared as a dark grey.

4.1.3 Infrared Imaging

Two photographs were taken using infrared radiation (IR): reflected infrared (RIR), and transmitted-IR. The artwork was also photographed using visible induced infrared luminescence (IRLUM) The infrared luminescence image (IRLUM) was captured with the modified camera with an X-Nite 780 filter. The illumination was a Powersmith Work LED light, modified with two 3 mm thick BG 38 filters to block emitted infrared. Thus, the IR-passing X-Nite 780 filter allowed the camera to record only the infrared luminescence emitted by the painting. An image recording the reflected infrared (RIR) radiation from the painting was captured with the modified camera with an IR-passing X-Nite 1000 filter. The illumination was the same Profoto tungsten lamps as the 'normal' illumination setup, but as the lamps were allowed to emit infrared the image recorded what IR the painting reflected towards the camera. The transmitted infrared image was captured with the modified camera with an IR-passing X-Nite 1000 filter. The illumination source was the light table equipped with an Ushio IR Halogen MR-16 (JR12V-378W/FL/FG/IR, 37W/12V/3000K) flood light.

Figure 16: Before Treatment. Close-up. visible induced infrared luminescence.

In the IRLUM image (Figure 16), the pigment used to overpaint the cheeks and some areas in the veil luminesce. Cadmium pigments are known to luminesce under induced infrared luminescence. However, it cannot yet be confirmed if the restorer used this pigment for the overpaint.

Figure 17: Before Treatment. Front. Reflected Infrared Radiation.

The RIR image (Figure 17) revealed minor adjustments, either done by previous restorer or the artist. Especially seen above the shoulders where there is a dark grey curvature, possibly an adjustment of the shoulder placement. The areas of overpaint also seem to appear a slightly darker grey compared to the "original" paint. Also, a thrilling discovery was made when the reflective infrared radiation image of the reverse was taken. A signature was found alongside a date on the bottom right of the verso of the canvas (Figure 2). It is unknown if the signature

belongs to the artist, the sitter or someone else. The cursive of the signature makes it slightly illegible and hard to identify the name. Two numbers on the date are also hard to distinguish. What can be confirmed is that the name begins with a "B" and the painting was completed around mid-1840s.

Figure 18: Before Treatment. Front. Transmitted reflected infrared radiation.

The transmitted infrared radiation image reveals cracking throughout, emphasized by the contrast with the dark garment (Figure 19). The outline of the tear-repair patches on the reverse can be seen in the middle of her face (Figure 20) and slightly on her thumb. The thicker areas will appear darker in the image. The thick layer of overpaint on her nose and cheeks were dramatically emphasized by the dark area on her face. In Figure 20, an underdrawing can possibly be seen.

Figure 19: Before Treatment. Close-up. Transmitted reflected infrared radiation.

Figure 20: Before Treatment. Close-up. Transmitted reflected infrared radiation.

4.2 Material and Technical Analysis and Results

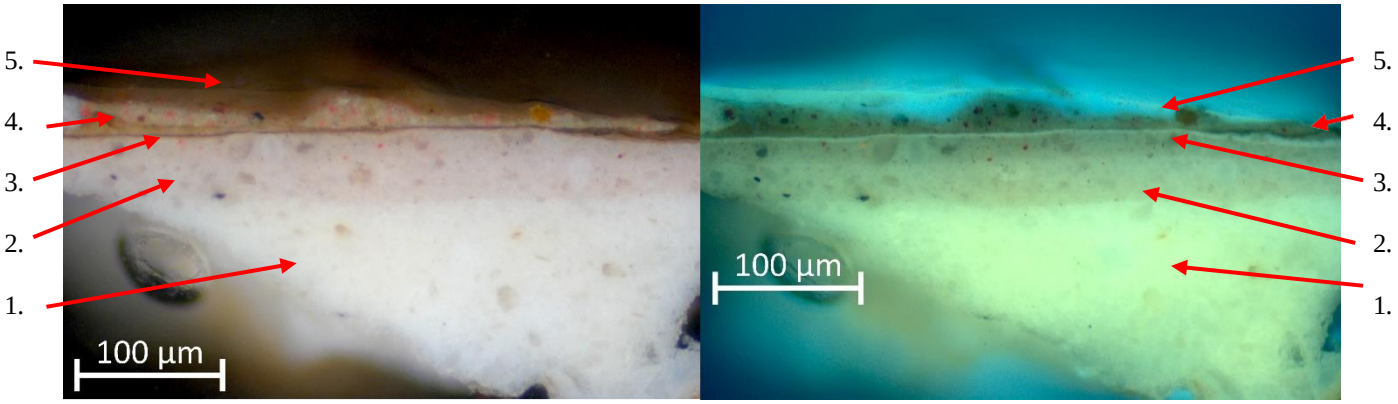
In addition to imaging, scientific analysis was used to help identify the composition and materials used in this painting and will aid in identifying/confirming possible locations of overpaint. Cross-section analysis, Transmission Fourier Transform Infrared (FTIR) Microscopy, and, X-ray Fluorescence (XRF) were some of the techniques used for scientific analysis.

4.2.1 Cross-Sections

Small samples of the surface were extracted and prepared for cross-sections. Cross-sectional analysis was performed on paint flakes extracted from existing tears and areas of loss to provide a fuller picture of the layering structure of the painting. Four samples were taken: two from the paint loss around the tear of the hand, one from the top edge where it was previously

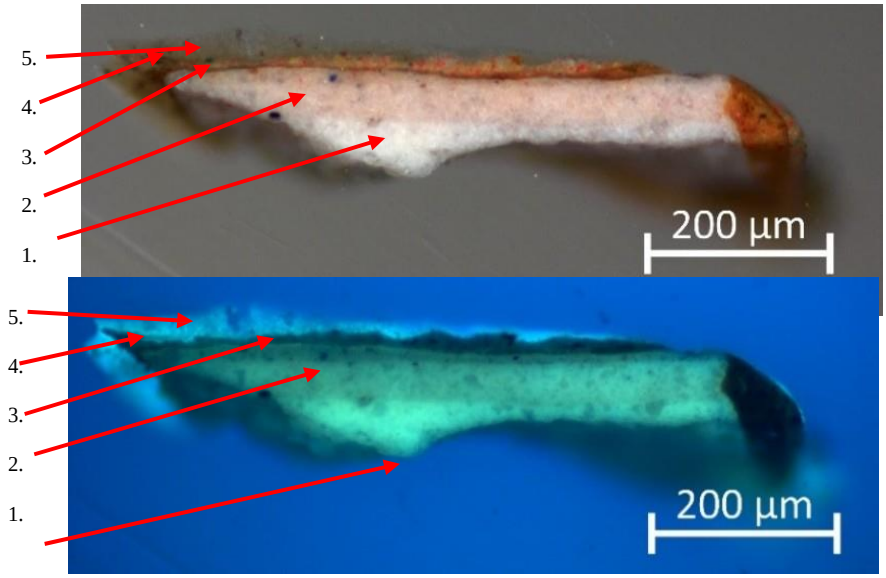
tested and suspected to be overpaint, and lastly one from the bottom edge. The samples were taken with a scalpel under a microscope. Each sample was then cured in Solarez UV-curing resin and polished. The cross-sections were examined with a Zeiss Axio Imager A1m microscope equipped with illuminators for darkfield illumination and fluorescent microscopy. Images were taken using Zen 2.0 software.

A total of four small samples were taken from the painting for cross-section. However only three were successful, two from the loss on the hand (samples #1 and #2) and one from tacking loss on the top edge by the tested area (sample #3).

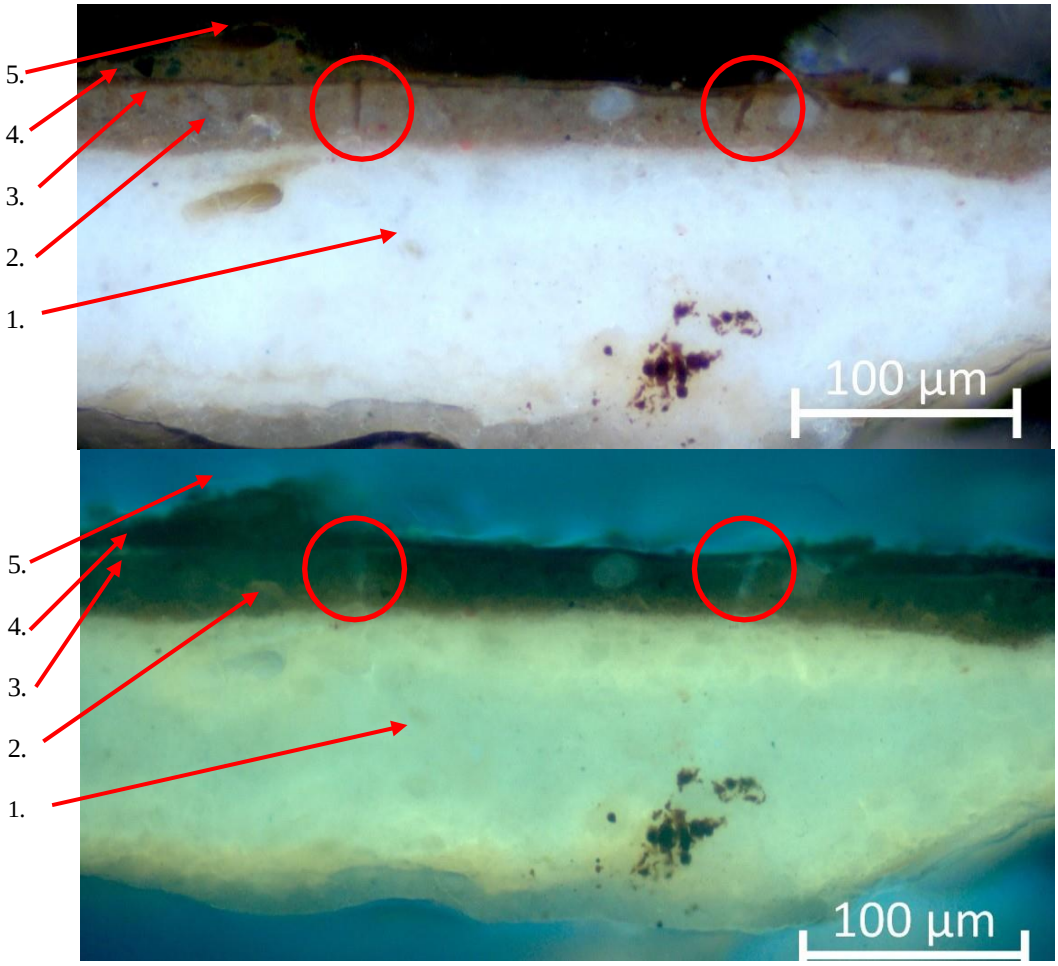


Figures 21 (left) and 22 (right): Cross-sections of sample #1 under microscope with 100 µm magnification. Figure 22 under fluorescent microscopy. Painting layering structure marked and numbered: 1. white ground layer 2. Original paint layer 3. Thin dark line 4. Another paint layer (overpaint), and 5. Thick top varnish coating.

The first two cross-sections had a clear image of the layering structure of the painting. From bottom to top it showed a 1. white ground layer, 2. Original paint layer (flesh tones), 3. Thin dark line, 4. Another paint layer (overpaint), and 5. Thick top varnish coating. The thin dark line (3. in Figure 22) in-between the paint layers fluoresce under UV illumination, suggesting a secondary natural resin varnish layer between the original paint and the overpaint. The bright red dots indicate red pigment was used on the flesh tones. Since the red didn't fluoresce under ultra-violet illumination, it was not a lake pigment. The presence of mercury found on the flesh-painted areas using XRF suggests the red pigment could be vermillion. There are blues, ochre yellows, and other earth tones also seen in the paint layers, but the exact pigment cannot be currently confirmed. On sample #2, seen in Figures 23 and 24, the top paint layer seems to dip on the right over the original paint and ground. Knowing the location of the sample (tear loss on hand), it is probable that the top layer/s were brushed over the damaged area and into the paint layers resulting in this unusual dip on the side.



Figures 23 (top) and 24 (bottom): Cross-sections of sample #2 under microscope with 200 µm magnification. Figure 24 under fluorescent microscopy. Painting layering structure marked and numbered: 1. white ground layer 2. Original paint layer 3. Thin dark line 4. Another paint layer (overpaint), and 5. Thick top varnish coating.



Figures 25 (top) and 26 (bottom): Cross-sections of sample #3 under microscope with 100 µm magnification. Figure 26 under fluorescent microscopy. Painting layering structure marked and numbered: 1. white ground layer 2. Original paint layer 3. Thin dark line 4. Another paint layer (overpaint), and 5. Thick top varnish coating. Cracks on paint layer marked in red.

Similar to the previous two samples, sample #3 has a clear layering of white ground, original paint, another darker paint layer on top of the original, and a final varnish layer. The secondary varnish layer, found in-between the paint layers in the previous two samples, is harder to distinguish. The thin layer can be seen mostly on the opposite ends of the cross-section, but the image is too hazy due to polish residue to clearly identify. There is a larger presence of blue and yellow in the top paint layer suggesting that the green paint layer is also overpaint. Unlike in samples #1 and #2, two cracks were found in sample #3 (Figures 25 and 26). These cracks are present in the original paint layer. The top paint layer and varnish was applied overtop of the cracks, meaning they were added after it originally cracked further confirming the presence of overpaint. Under fluorescence, the cracks fluoresce due to the varnish entering the structure as it was brushed over the damage.

4.2.2 M-Transmission Fourier Transform Infrared Microscopy

Infrared spectra were collected using a Continuum microscope coupled to a Nicolet 6700 FTIR spectrometer (Thermo Scientific). Five samples were tested using Transmission FTIR Microscopy. The samples were extracted from the reverse (adhesive from previous tear repair, and ground) and from the painting surface (overpaint on the cheeks, black paint around the bottom edge, and darker area around the top of her hand) using a tungsten needle. The samples were prepared by flattening them in a diamond compression cell (Thermo Spectra Tech), removing the top diamond window, and analyzing the thin film in transmission mode on the bottom diamond window (2 mm x 2 mm surface area). An approximately 100 μm x 100 μm square microscope aperture was used to isolate the sample area for analysis. The spectra are the average of 64 scans at 4 cm^{-1} spectral resolution. Correction routines were applied as needed to eliminate interference fringes and sloping baselines. Sample identification was aided by searching a spectral library of common conservation and artists' materials (Infrared and Raman Users Group, http://www.irug.org) using Omnic software (Thermo Scientific). (Ploeger, 2019)

On the reverse, there were two patches from a previous tear repair. During treatment it was noted that the adhesive used for the repair was water-soluble. The adhesive was tested using

M-Transmission FTIR Microscopy and the infrared spectra revealed the adhesive to be a wheat-starch paste. However, there was other components mixed in besides wheat-starch paste. As seen on Figure 27, the majority of the peaks of the sample matches the peaks of wheat-starch paste. Nevertheless, there are a few differences in the sample spectra. With the aid of the database provided by Omnic software, we were able to find potential matches for the missing peaks in the sample. A natural resin, such as dammar and zinc stearate, may also be present, and are shown as potential spectral matches in Figure 27. Natural resins, such as dammar, are common varnish that could have been used as a coating on the painting and soaked through the reverse where the adhesive was found. Zinc stearate is also a common component, especially in the usage of white pigment, such as zinc white and soap formation. XRF also revealed the presence of zinc, particularly on the overpaint seen on the face (Figure 33d).

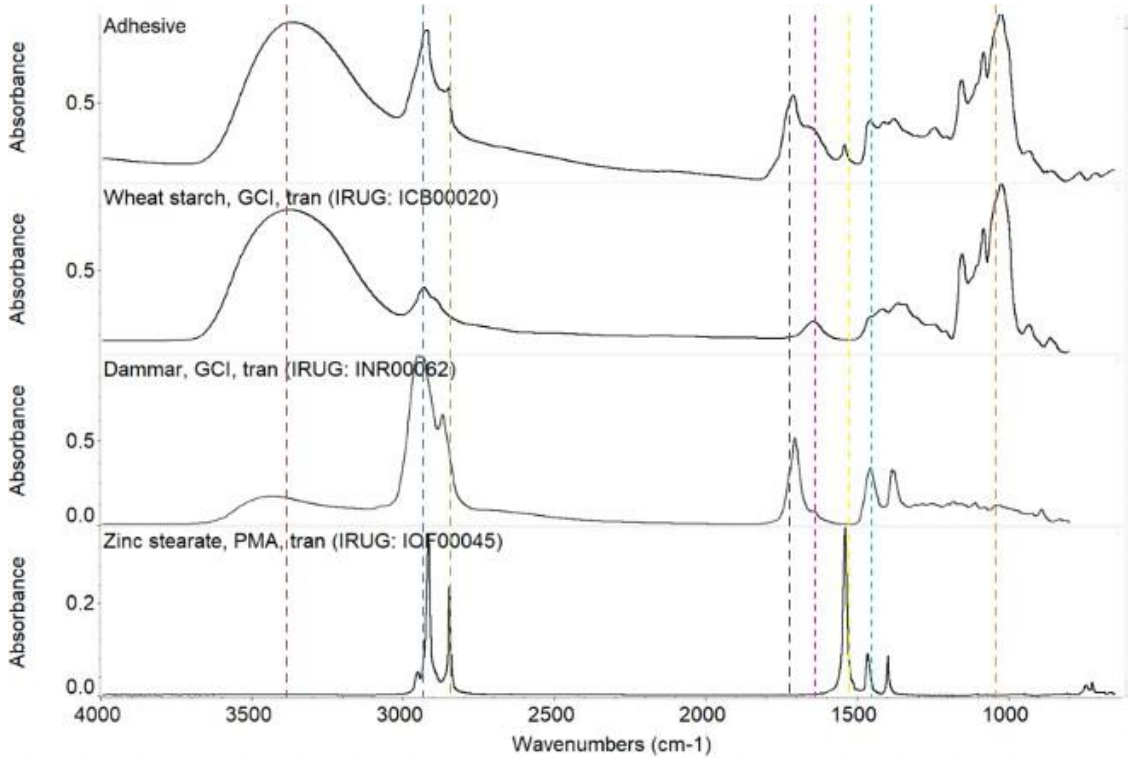


Figure 27: Infrared Spectra of adhesive sample, wheat starch, dammar, and zinc stearate.

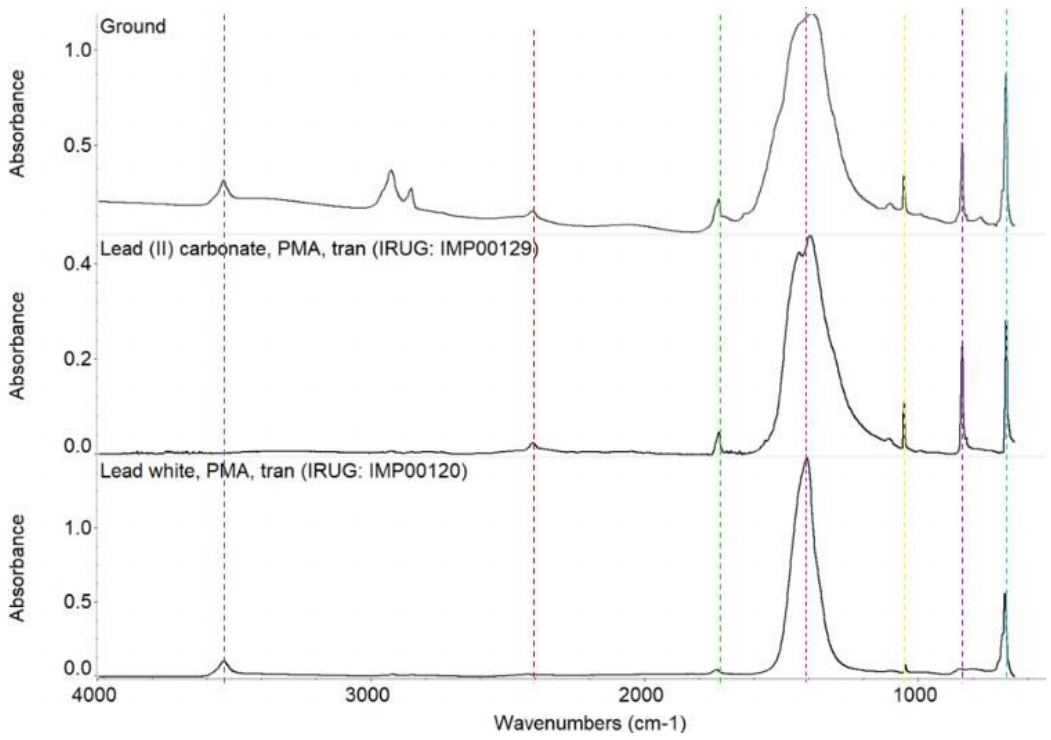


Figure 28: Infrared Spectra of ground sample, lead (ii) carbonate, and lead white.

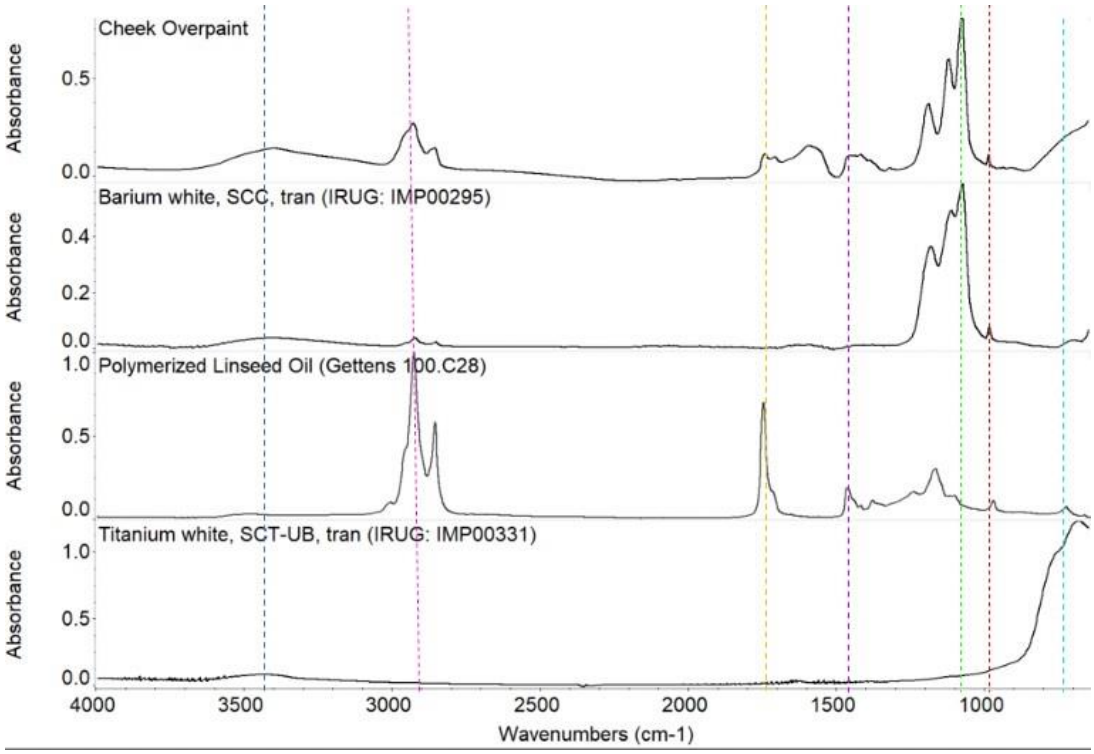


Figure 29: Infrared Spectra of overpaint sample, barium white, linseed oil, and titanium white.

Similar to the previous test, the sample was taken from the reverse. The ground appeared to have been pressed through the open canvas weave during application, letting us take a sample without disturbing the paint layer. The question was raised if the ground contained lead. Lead white was also known to be potentially used a prime layer instead of gesso. For health and safety reasons, the ground was tested and the infrared spectra did reveal that it was lead based (lead white) with some organic component mixed in.

The overpaint infrared spectra showed multiple components. The base component of the sample appears to be barium white. However, there seems to be presence of titanium white and probably linseed oil. There are still a few unidentified elements in the spectra, which is understandable due to complex mixture of the overpaints. The type of oil present can't be fully confirmed using only this method.

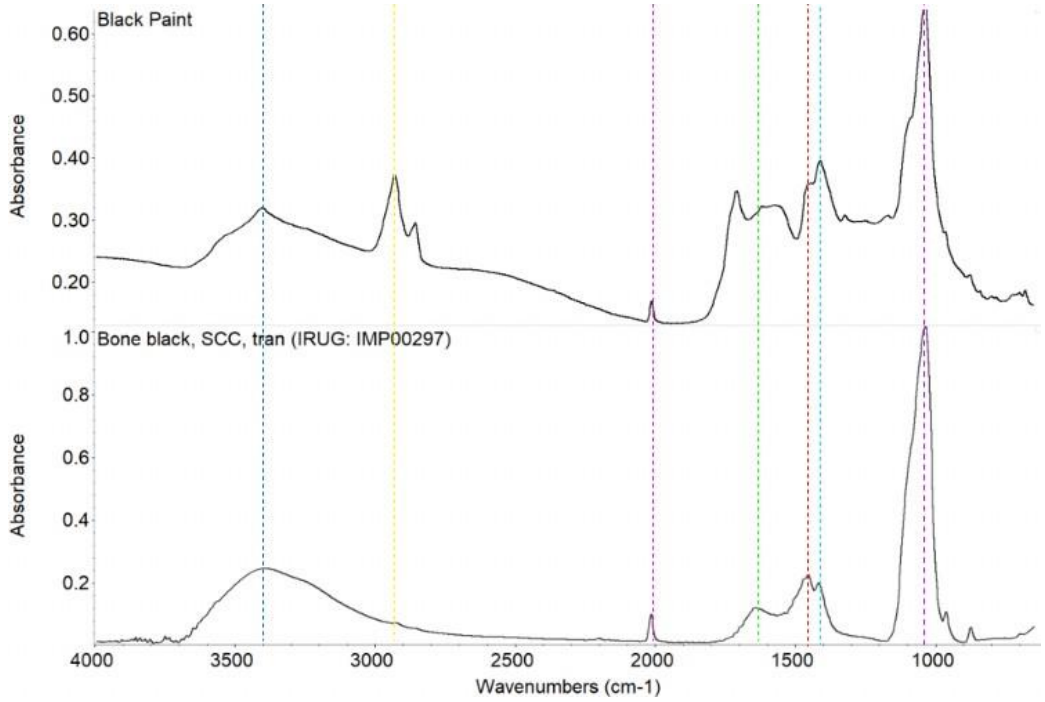


Figure 30: Infrared Spectra of black paint sample and bone black.

The infrared spectra of the black paint sample were more straight forward. The spectra peaks of the sample matches with those found in bone black. Similar as with the other samples, there are other components mixed in with the bone black, most likely oil. Due to the location the sample was extracted from, the bone black could be from the black overpaint, the original paint layer, or perhaps both.

Contrary to the previous test, the sample taken from the darker side of the hand is more difficult to fully identity with this current technique. The database provided two different high potential matches (orange shellac and tung oil). However, further testing is needed to identify the material.

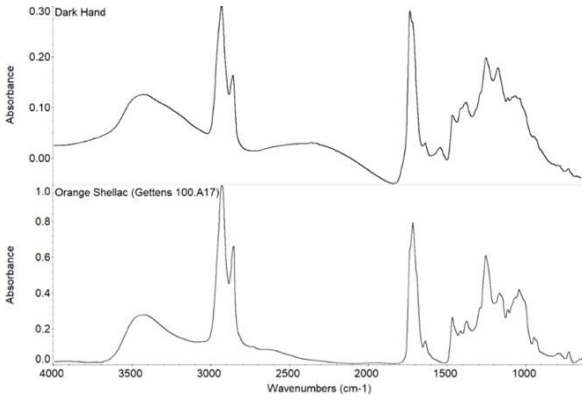


Figure 31: Infrared Spectra of hand sample and shellac.

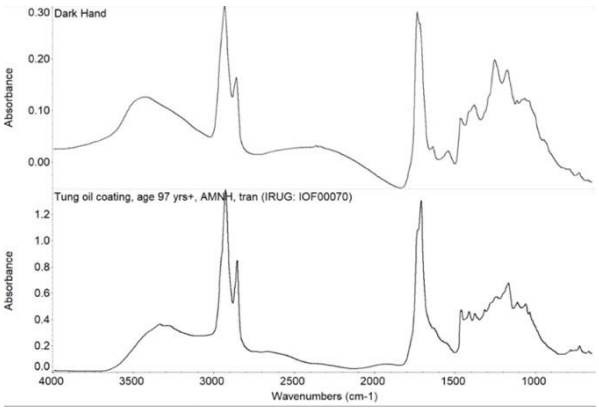


Figure 32: Infrared Spectra of hand sample and tung oil coating.

4.2.3 X-ray Fluorescence Spectroscopy

DeWitt MPS-400E scanning gantry was used to collect XRF elemental maps utilizing a Bruker 5i XRF. The scanner has a total scanning range of 330 mm in the X axis and 440 mm in the Y Axis at as low as 1x1mm pixel collection. Scans were taken using a 2 mm collimator at a rate of 2x3 mm in the X and Y axes, respectively. The total area scanned was (406 x 508) mm. The XRF was set at 35kV 110uA with no filter. Data was collected in DeWitt proprietary software and exported into Artax for analysis. The deconvoluted area under peak for each element identified was exported into excel and processed in GoldenSoftware's Surfer Software to create the individual elemental maps. (Shugar, 2021)

Figure 33: a) Normal image of sitter's bust. b) XRF mapping image of barium on sitter's bust. c) XRF mapping image of titanium on sitter's bust. d) XRF mapping image of zinc on sitter's bust.

Some of the XRF results emphasizes the area of overpaint on the face. On Figure 33, it shows the barium (b), titanium (c), and zinc (d) present on the face. These elements seem to be present in the same of location of where overpaint was found. It is most likely from the pigment used to overpaint the area. This can be confirmed by the FTIR results. As mentioned before, barium white was the base of the overpaint taken from the same location on the face (right cheek). Titanium was also present in the infrared spectra of the overpaint sample. Titanium white started being used as a pigment around 1916 (Bernstein, 2005). Knowing the portrait was painted in the 1840's, it can be confirmed that the titanium found is from the overpaint. The XRF mapping image of zinc was different from the rest in the sense that it was also present around the veil and on the collar. Traces of zinc were also found in the spectra of the adhesive sample extracted from the reverse. Unlike titanium white, zinc white

was available since the 1780's (Bernstein, 2005). It is probable that zinc white is part of the original paint but further testing is need to confirm.

Figure 34: XRF mapping image of cadmium on sitter's bust.

Figure 16: Before Treatment. Close-up. visible induced infrared luminescence

Additionally, there were also traces of cadmium on the cheeks and forehead (Figure 34). Cadmium is known to luminesce under infrared luminescence. Multiple areas on the face and veil lumines under infrared luminescence (Figure 16), especially the cheeks. Despite having cadmium present in the cheeks, it doesn't seem to be present anywhere else. Cadmium pigments were introduced to artist in different years. While cadmium yellow first became available to artists around the 1830's, it was not until 1919 that other cadmiums, such as red and orange, were produced. The cadmium pigments were also known to be expensive during that time and it was not until 1920's where the cost of the pigments reduced (WILEY-VCH, 2009). It is plausible that a cadmium pigment (such as cadmium red) was used to overpaint the cheeks as if to add a blush to the complexion.

Figure 35: XRF mapping image of lead on sitter's bust.

Figure 36: XRF mapping image of phosphorous on sitter's bust.

The XRF findings of lead and phosphorous also coincide with the FTIR results. Figure 35 shows lead present basically throughout the whole painting which is confirmed by the FTIR findings of the ground being lead based. The darker areas in the lead XRF mapping image are the barium blocking the lead readings. Lastly, traces of phosphorous were found on the hair, pupils, and garment. Phosphorous is an element found in bone black. This was, once again, confirmed with the FTIR result of the black paint where the infrared spectra matched bone black.

5 CONSERVATION TREATMENT

5.1 Goals and Obstacles

The main goal of the treatment was to find a suitable conservation method to safely remove the overpaint without disturbing the original painting underneath. Scientific material analysis assisted in differentiating the paint layers and identifying the materials present in the artwork. The removal of the overpaint proved to be difficult depending on their location and material. Overall, the object of the treatment is to reduce the overpaint and reveal as much of the original paint layer as possible, stabilize the painting, and leave a more unified surface appearance.

5.2 Treatment

The first steps of the treatment were removing the painting from the frame and backing board attached to the reverse. Dirt and grime were removed using 1% Tri-Ammonium Citrate and rinsed with Distilled water on swabs. There were not a lot of visual change as expected. The varnish was removed with ethanol: odorless mineral spirits (2:1) solution, ethanol, and, isopropanol. The ethanol: odorless mineral spirits solution was also effective in removing some of the overpaint around the neck and face. The skin tone drastically changed as the varnish and overpaint were being removed. After the varnish was removed, there were still many

Figure 37: During varnish and overpaint removal.

layers of overpaint left on the middle of her face. There was also some overpaint (such as around the right eye) that was not soluble in the ethanol solution and needed another method to be removed. Fortunately, the majority of the overpaint on the was face was able to be removed using ethanol with 10% benzyl alcohol.

Figure 38: UVA induced visible fluorescence image. During overpaint removal indicating the large amount of overpaint still present (dark purplish tones) and greenish fluorescence from varnish still present.

After the varnish was removed, the artwork was photographed under UVA induced visible fluorescence. Without the bright fluorescing varnish, the overpaint could be clearly identified on the painting (Figure 38). Together with the scientific material analysis, it was confirmed the artwork was overall overpainted. Further solvent testing was performed to remove the remaining overpaint.

The overpaint in the background was difficult to solubilize. The solvents did not have a similar effect as it did on the face. A Carbopol Acetone gel (110mL Acetone, 1.2g Carbopol 934, 15mL Benzyl alcohol, 15 mL water, 4g ethomeen) and Ethanol gel (100mL ethanol, 2g Carbopol, 2mL water, 7mL ethomeen) with Japanese tissue paper was used to remove the overpaint (Figure 40). As the cleaning continued, the overpaint removal became increasingly complex. Multiple solutions were used depending on how the overpaint behaved: 2:1 ethanol: odorless mineral spirits, 100% ethanol, ethanol with 2% benzyl alcohol, ethanol with 10% benzyl alcohol, and Pemulen stock gel pH7 with ethanol. Additionally, tests were conducted with increasingly polar solvents to determine whether the overpaint could be safely removed (including diacetone alchohol, dimethyl sulfoxide, and benzyl alcohol). The artwork was inspected with UVA lamps during the process to track the overpaint removal. Despite reducing the overpaint and revealing a significant amount of original artist's paint, it was not possible to safely remove all the overpaint. Stubborn overpaint is still present in several areas in the background and the garment.

Figure 39: During overpaint removal.

The tape on the tacking edge was mechanically removed with a spatula and scalpel. The tacks and stretcher were removed. The tacking edges were humidified with a dampen blotter and left under weights overnight to gently flatten them and allow the attachment of a temporary working stretcher. The previous tear repair patches were mechanically removed. The adhesive used for the previous tear repair resulted to be water soluble. To reduce the exposure of moisture to the painting, Gellan gum gel was used to soften the adhesive to then be removed using a scalpel. A temporary edge lining was attached to the canvas using Hollytex and Beva film. Afterwards, the artwork was attached to a temporary stretcher.

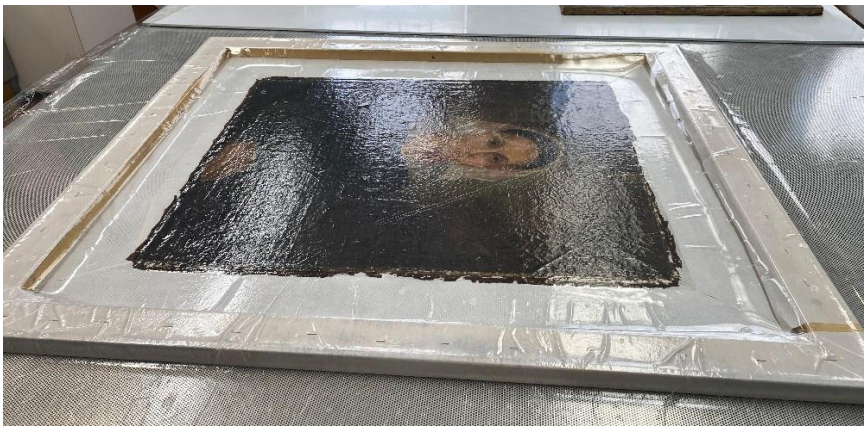


Figure 40: During humidification

The painting was humidified with the suction heat table. A dampened fiberglass fabric was dampen and placed under the painting along with a pe-cap polyester screen to prevent adhesion (Figure 39). The painting was left to humidify for about 10 minutes. Later the dampened fiberglass fabric and polyester screen were replaced with Shweitzer paper to remove the excess moisture and prevent the painting to adhere on the table. This process was repeated once more for 20 minutes.

Regalrez 1094 (40% Regalrez in ShellSol D38) was brushed on the local areas of loss as a barrier layer for the original paint prior to the application of fills. Later, the areas of loss were filled with BEVA fills. Lascaux welding powder was added to the reverse of the tears to fortify the previous adhesion. The temporary edge lining was removed by reactivating the BEVA film with a tacking iron. A canvas edge lining was performed using Beva film and linen canvas. The stretcher was cleaned and sanded into a round edge to reduce roughness. The gaps in the mortises were filled with balsa wood shims and wax (beeswax: W-445 microcrystalline wax: Zonarez 7085, 2:2:1) and later sanded until level to increase structural stability. The loose keys

were also resecured with the same wax mixture to prevent falling out in the future. Afterwards, the tacking edges were carefully folded using tacking iron and tacked to stretcher with pins to slowly adjust. The painting was stretched and tacked to the original stretcher support with new copper tacks and barrier circle of acid-free manila folder stock. The excess canvas was then secured and tacked on the reverse of the stretcher. A backing board composed of blueboard was attached to the reverse with screws and metal washers.

The painting was brushed varnished with 15% laropal A81 in 3:3:4 shellsol A100: Shellsol 340: Xylene with 2% Tinuvin 292 (Figure 41). Dry powder pigments, Galdehyde (Laropal A81) inpainting resin and 1-methoxy-2-propanol solution were then used to inpaint. During inpainting, it was important to exert restraint and stay within the ethical boundaries of inpainting while also considering the balance of the composition. There were some areas where it was necessary to inpaint over the old overpaint to better balance the composition and improve aesthetically. A final layer of varnish was then sprayed after compensation.

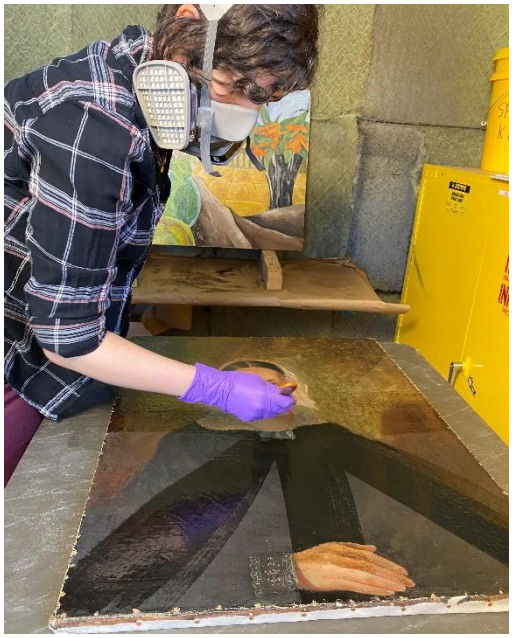


Figure 41: During varnishing.

The interior of the frame was slightly sanded to better accommodate the painting. Volara foam rabbet tape was adhered along the inside of frame's rabbet to prevent abrasion between the surface of the painting and the frame. Lastly, the painting was secured on the frame with brass mending plates and new hanging hardware (D-rings) was attached to the back of the frame.

5.3 Recommendations for Storage and Display

Due to the painting belonging in a household, there will not be many available options to control and monitor the environment compared to museum standards. The best option will be to recommend accommodable ways to best preserve the artwork in every day household conditions. Ideally, the painting should be placed on an interior wall. The painting should be placed in a location where it is least likely to accidentally have someone or an object collide with it, and it should be away from smoke and grease (i.e., avoid displaying it in kitchen or around a fireplace). To avoid light degradation and fading, the painting should be located in a spot away from windows and/or where there is no often direct sunlight. The artwork should be placed in a room

where the temperature and relative humidity is constant. If possible, the environment could be monitored and controlled to at least keep it at a constant range of 65-75ºF and 40-65%RH. If the relative humidity reaches above 80% for some time, the artwork is in danger of biodeterioration and should be monitored for mold appearance. The painting and frame can also be harmed by common insects, such as carpet beetles and cockroaches. It may also be beneficial to place sticky blunder traps or pheromone traps in dark spots and corners to detect insect presence around the painting.

6 CONCLUSION

The 19th century oil portrait of a woman depicts the owner's great-great-great-grandmother. Further historical research revealed the woman to be Elizabeth Edwards Harvey, Thomas Harvey's second wife and mother of three children. The artist is still unknown. However, the artwork was confirmed to be dated around the 1840s. A letter provided by the owner mentioned the painting was taken to a restorer but returned with unsatisfactory results. The painting was then brought to additional conservators, where several cleaning tests were performed. The painting exhibited vast areas of overpaint, especially on the face. There was also evidence of other previous treatments not mentioned in the letter suggesting that the painting has been treated before it was inherited by the owner's father in the 60s.

Cross-section analysis revealed the paint layering structure of the artwork, confirming the presence of a secondary varnish layer and overpaint throughout the surface. Additionally, M-Transmission FTIR Microscopy and XRF were able to identify the materials found in the artwork such as bone black on the garment, barium white on the overpaint on the face, and lead on the ground. Reflective infrared imaging revealed an unknown signature and date on the reverse. Ultraviolet-Visible Fluorescence imaging assisted in identifying potential areas of overpaint during treatment. In the end, scientific analysis and multimodal imaging greatly aided the treatment process.

It was expected to come across some difficulties during treatment due to the amount of overpaint present. However, the overpainted surface has resulted to be more complex than first initialized. The main concern of the obstructive overpaint on the face has been successfully attended to. Reintegration of the losses resulted in the woman resembling more closely the artist's original intention. The overpaint in the background was reduced, improving the overall

aesthetic of the portrait. The painting is structurally and aesthetically stable and can now be safely displayed.

7 ACKNOWLEDGEMENTS

I would like to give my sincere thanks to all the faculty and staff in Patricia H. and Richard E. Garman Art Conservation Department at Buffalo State College. Special thanks to my advisor Professor Fiona Beckett for encouraging and guiding me during the treatment. Also, great appreciation to my co-advisors Dr. Aaron Shugar and Dr. Rebecca Ploeger for assisting and advising with the scientific analysis and data interpretation and Professor Jiuan-Jiuan Chen for advising on imaging techniques and interpretation. Also, to Aprille Nace for being able to find more about the history of this mystery woman. A great thanks to the owner of the painting for letting me explore the wonders of overpaint removal. Additionally, an immense gratitude to those who have funded my education. Lastly, a great thanks to all my family and classmates who have shown great interest in this treatment that made it all the more exciting to experience.

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9 AUTOBIOGRAPHICAL STATEMENT

Camille Ferrer is a graduate student with a specialization in paintings at Patricia H. and Richard E. Garman Art Conservation Department at SUNY Buffalo State College in pursuit of receiving a Masters of Art and Certificate of Advance Study in Art Conservation in 2023.

Camille is originally from Puerto Rico where she was a pre-program intern at the Museo de Arte de Ponce, in both the paintings and objects conservation labs, and also at Museo de Arte de Puerto Rico as a painting conservator intern and later as a paper conservator assistant. She earned a Bachelor of Arts degree in art history, with a minor in chemistry, at Suffolk University

in Boston, Massachusetts, where she also interned in the outdoor sculpture conservation lab at the Museum of Fine Arts Boston.

The summer of 2021, Camille completed an internship at Page Conservation Inc. in Washington D.C. In 2022-2023, Camille will be third-year graduate intern in ArtCare Conservation.

10 LIST OF FIGURES

11 APPENDICES

APPENDIX A: EXAMINATION REPORT AND IMAGE PAGES

APPENDIX B: TREATMENT REPORT AND IMAGE PAGES

PATRICIA H. *and* RICHARD E. GARMAN
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PAINTINGS EXAMINATION REPORT

CNS 197826

OWNER/AGENT	[redacted]
OWNER'S ID NR.	
DATE RECEIVED	September 27, 2019
EXAMINER	Camille Ferrer
FACULTY SUPERVISOR(S)	Fiona Beckett
DATE OF REPORT	October 27, 2021

Figure 1: *Portrait of a Woman* with frame.

ARTIST/MAKER (Owner Attribution)	Unknown
SIGNATURE and its LOCATION	N/A
TITLE ("") or DESCRIPTION	Portrait of a Woman (Betsy)
DATE	N/A (19th century)
STRUCTURE	Oil on canvas
DIMENSIONS (H x W x D)	35 ½" x 29 ½" x 2 3/8" (in frame) 30 1/8" x 24 1/16"x 13/16" (without frame)
ACCESSORIES	Gold painted frame with repeated foliage pattern.
LEGENDS/LABELS	
OTHER DISTINGUISHING MARKS	

I. DESCRIPTION

The artwork "Portrait of a Woman" is an oil on canvas painting. The painting (Figure 1) depicts as the title indicates, a portrait of a woman wearing black clothing, a bow on her collar, and a "white" veil. There appears to be no signature visibly present. The artist is unknown. The owner provided a letter that shares some background of the woman in the painting. The woman seems to be the owner's great-great-great grandmother, Betsy Richards. Betsy lived in Northumberland County, in Northern of Virginia, where her and her husband grew tobacco. Her husband, Thomas, served in the Virginia legislature and was a major in the Virginia militia. In 1835, they moved to Saline County, Missouri, to land outside the village of Marshall, joining a number of other Virginia planters who moved to that region and bringing with them their entire household, including a number of children, dead relative's children, and slaves. They then traveled by boat to Pittsburgh. They carried the boats over the Appalachians to Ohio River, and from there floated their way to Missouri. In 1837, Thomas was elected Speaker of the House in the Missouri legislature, and in 1840, to the Missouri state senate. Beginning in the early 1840's, he served as Superintendent of Indians west of the Mississippi, based in St. Louis. The letter ends with a note by the owner stating "Although we have read some of the Major's correspondence with Congress in which he (Thomas) pleaded on behalf of Indian nations that were starving and being given pox-ridden blankets. I do not think of him or Betsy as heroes. They lacked the moral insight and courage to stand up against systems of oppression and in fact benefited from those systems. They are, however, part of history of my family and the history of this country."

The artwork was inherited by the owner's father in the 1960's after the death of her grand-aunt. She later inherited the painting after her mother's death. The painting, to her knowledge, have always been hung in their household and never stored.

II. CONDITION

- **Summary:** The full state of condition of the painting is unknown due to some of the surface being overpainted. The little areas that have been previously cleaned/tested, where the original paint is seen, shows evidence of paint loss and abrasions. The varnish layer has discolored over time, darkening the image. The canvas, especially on the bottom, is undulated. There are some areas of loss/flaking paint. There are two patches from a previous treatment on the reverse of the canvas. Potentially suffered two tears. There is masking tape on the right and upper right tacking edges.

• SUPPORT

The canvas is a white primed, unlined canvas tacked to a wooden stretcher. The tacks were placed on top of the canvas instead of the tacking edges. Holes on the canvas edges suggest that the tacks were previously on the sides, but then removed and later placed on top. The reason behind the peculiar re-location is unknown. Additionally, the tacks present are not the original due to having different size than the holes on the tacking edges. The stretcher consists of four wooden members with a Mortise with double miter and keys joints. There are 5 out of 8 keys present. Appears to be in sturdy/structurally sound condition with scratches and abrasions throughout. "Woman X *check mark*" is written in graphite on the bottom member. The stretcher is not believed to be the original due to multiple factors. Among them is the tacking edges being too thin on two sides (top and bottom) to properly be tacked. Also, the paint seems to extend on the thicker tacking edges. Lastly, there are no holes on the stretcher edges where the original tacking should have been located. It is believed the artwork was moved to a different stretcher and tacked on top due to not having enough material to tack on the other two edges. More extensive research regarding the treatment history is needed to confirm this claim.

The primary support is a unlined, thin, plain weave canvas. The bottom of the canvas is undulated. The canvas has selvedge edges and white ground can be seen peeking through the weave. The tacking edges varies length on each edge. The right and upper right tacking edges are covered with masking tape and tacked. The tape detaches the paint layer from the canvas. An insect egg case is found in between the taped canvas and stretcher on the bottom left reverse. Two cloth patches can be found on the reverse of the canvas. A large rectangular patch (3" H x 7" L) with a loose upper right corner is found on the center of the canvas (behind the face) and a smaller patch (1" H x 2" L) found in the bottom center of the canvas. A dark circular shape with an accumulation of an unknown substance on the edges is present on the reverse bottom right of the canvas. Overall large accumulation of dirt and grime.

• GROUND/PAINT

The ground is thin and white. There are only one or two areas where ground can be seen on the left tacking edge. Most of the ground is visible on the reverse of the canvas, where it went through the thin weave during application. The ground can also be seen on the abrasions, especially where the original paint can be seen.

The paint layer is a thinly applied oil paint with little to no impasto. Drying cracks, common to ageing, are spread throughout. There is loss of pigment on the thumb and index finger (bottom-center of the painting) and on the edge of her right eye (observer's left) where the two tears are present. A diagonal crease was found on the upper right corner and a curved crease is seen on her left shoulder. Insect secretions are found on her hand. There are areas with slight lifted/flaking paint, especially on the upper right corner. There is evidence of overpaint almost all over the original paint layer. Large amounts can be found on her face, and most of the dark

background. The uneven sheen and layer of dirt and grime throughout the artwork, makes it hard to distinguish other potential areas of overpaint. There is a possibility of multiple paint loss underneath the overpaint. The full state of the original paint is not currently known due to large amounts of overpaint. More information will be known as treatment progresses.

The artwork has been tested by previous conservator on four areas. The upper-center edge, the woman's upper-left side of her face (around the eye), her bow in the center and on the bottom half of her hand. The test spot on her hand reveals the paint with the discolored varnish removed. The other three areas is believed are locations where the overpaint was removed and is currently revealing the original paint layer. Further testing will determine if the overpaint was removed in upper-center test area or if it is result of overcleaning.

- **VARNISH/SURFACE**

The artwork has an unevenly shiny varnish layer. There are multiple areas with varied degrees of gloss. The varnish is likely a natural resin due to green fluorescence under ultraviolet illumination. Ultraviolet illumination also reveals the varnish being very loosely applied before framing. There are sections where the brushwork can be seen. However, it seems like the varnish was loosely poured/applied and spread around with a brush or cloth to cover the whole surface. The varnish layer has significantly discolored over time. As mentioned above, the previous conservator removed the discolored varnish on the bottom half of her hand revealing the "original" paint color. The other areas where overpaint was potentially removed, has still some gloss. Except for the test on the bow where the surface is completely matt.

- **FRAME**

The frame is in an overall, good and stable condition. The frame is dark warm gold painted frame (3 ¼" thick) with a consistent repeated foliage pattern throughout. A minor abrasion is found on the bottom right edge. There is dark discoloration and staining throughout, especially on the edges. The bottom edge has multiple paint losses and abrasions. On the reverse, bottom member of the frame has "woman XL" written in graphite. Volar foam tape was present on the rabbit (possibly placed by previous conservator). Layer of dust and grime is present throughout the frame. Previous conservator placed a grey coroplast backing board to protect reverse of the canvas.

III. PREVIOUS TREATMENT

In the owner's letter (mentioned earlier), she also expands on the history of conservation on the painting. The owner states that her father, after inheriting them in the 1960's, took the portrait to a restorer in Washington D.C.. They were dissatisfied after the portrait was overpainted by the restorer and changed the appearance of Betsy. After about ten years, the owner inherited the paintings and then taken to Westlake Conservators in Skaneateles, where they did an exploratory cleaning. The cleaning revealed the finer details in the portrait and demonstrated the degree of dirt and soot on the portrait. Westlake placed new backing boards on the painting.

Upon further examination, it is revealed that the painting has also gone through further treatment that were not previous stated. It is unknown if this happened around the same time as the "first" treatment with the overpaint or before the painting reached the owner's father in the 60's. On the reverse of the canvas, there are two patches which signifies that the painting suffered two tears. Also, the tacks were placed on top instead of the tacking edges. There are holes on the tacking edges of the canvas, indicating that the tacks were previously on the edges but then removed and placed on top. It is unknown why the tacks were placed in a peculiar location.

V. REFERENCES

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EXAMINATION REPORT—Analysis & Photography/Imaging **CNS 197826**

PRE-TREATMENT PHOTOGRAPHS

No.	DESCRIPTION	TECHNICAL NOTES	COMMENTS
A1N	Front, framed. normal illumination, before treatment	Lighting approximates standard viewing conditions.	Note the four clean-tested spots on top edge, right-side of the face, bow, and bottom half of her hand.
A2N	Back, framed. normal illumination, before treatment	See A1N.	
A3N	Front, normal illumination, before treatment	See A1N.	Note the two patches at center and bottom, and dark stain at bottom right.
A4N	Back, normal illumination, before treatment	See A1N.	Note the tacks on top surface margins.
A5RK	Front, raking illumination, before treatment	The light was positioned at the left, at a low angle to the surface of the painting in order to emphasize the surface topography.	Note cracked paint layer throughout
A6SP	Front, axial specular illumination, before treatment	The light was positioned adjacent to the camera to create specular reflections on the surface. These reflections provide information about surface characteristics (e.g. matte vs. glossy) as well as information about surface topography (dents, bulges, cracks, etc.)	Severe canvas undulation along the bottom and crease on the top right corner of the painting
A7SP	Front, oblique specular illumination, before treatment	The subject was photographed at an oblique angle opposite the light source. The reflection of the light off the surface provides information about surface characteristics (e.g., matte v glossy) as well as information about surface topography (dents, bulges, cracks, etc.)	Note the matte area on the center where it was clean-tested. Also, note the uneven gloss throughout.
A8N	Top, bottom, left and right tacking margins, normal illumination, before treatment	See A1N.	Note the absence of tacks on left, bottom, and, partially, top tacking edges. Right and partial top tacking edges are covered with masking tape. Tacks were placed on top of the masking tape. Also, note the short length of the canvas on top and bottom tacking edge compare to left tacking edge.
A9TR	Front, transmitted illumination, before treatment	The source of illumination was positioned behind the subject. (The front of the subject is facing the camera.)	Note the dark area between her mouth and eyes, and above her shoulders. The perimeter of the rectangular patches behind the face and hand are visible. Cracks seen throughout.
A10UVA	Front, longwave ultraviolet (UVA) induced visible fluorescence, before treatment.	The subject was photographed in a darkened room while irradiated by a long wave ultraviolet lamp (blacklight). The ultraviolet radiation causes some materials in the subject to fluoresce (emit light). *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite CC1, PECA 918, and Kodak 2E filters*	Vanish fluoresces green overall. Varnish application loosely applied throughout. The four clean-tested areas do not have the green-fluorescent varnish.
A11UVA	Back, longwave ultraviolet (UVA) induced visible fluorescence, before treatment.	The subject was photographed in a darkened room while irradiated by a long wave ultraviolet lamp (blacklight). The ultraviolet radiation causes some materials in the subject to fluoresce (emit light). *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite CC1, PECA 918, and Kodak 2E filters*	

A12RIR	Front, reflected near infrared photograph, before treatment.	The subject was illuminated with incandescent lamps. A special camera, sensitive to the invisible near infrared radiation emitted by the bulb was used to record how the radiation penetrated the subject, or was absorbed or reflected by the materials in the subject. Infrared radiation may penetrate overlying layers to reveal underlying information or may help to characterize materials or to distinguish different materials that are similar in appearance. *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite 1000 filter.*	Note the darker areas around her shoulders. Also, note the slight lighter tone of the clean-tested area on the right-side of her face.
A13RIR	Back, reflected near infrared photograph, before treatment.	The subject was illuminated with incandescent lamps. A special camera, sensitive to the invisible near infrared radiation emitted by the bulb was used to record how the radiation penetrated the subject, or was absorbed or reflected by the materials in the subject. Infrared radiation may penetrate overlying layers to reveal underlying information or may help to characterize materials or to distinguish different materials that are similar in appearance. *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite 1000 filter.*	A signature and date were revealed on the bottom right corner.
A14IRLUM	Front, infrared luminescence, before treatment.	The subject was illuminated with an infrared free visible light source. The visible light energy is absorbed by some materials in the subject and released as invisible near infrared luminescence. The luminescence is photographed using a special camera filtered to record only infrared radiation. *Illumination source and filtration: White Light LED covered with BG38 filter* *Camera filtration: X-Nite 780 filter*	The paint used for the overpaint on the forehead and cheeks are luminant. The paint around the headpiece also seem luminant.
A15IRTR	front, transmitted near infrared photograph, before treatment	The subject was positioned in front of a standard incandescent bulb. A special camera, sensitive to the invisible near infrared radiation emitted by the bulb was used to record how the radiation was absorbed or transmitted by the subject. Infrared radiation may penetrate visibly opaque layers to reveal underlying information *Front of subject is facing the camera.* *Camera filtration:* *X-Nite 1000*	See A9TR

197826_A1N

197826_A2N

197826_A4N

197826_A3N

197826_A5RK

197826_A6SP

197826_A8N_composite

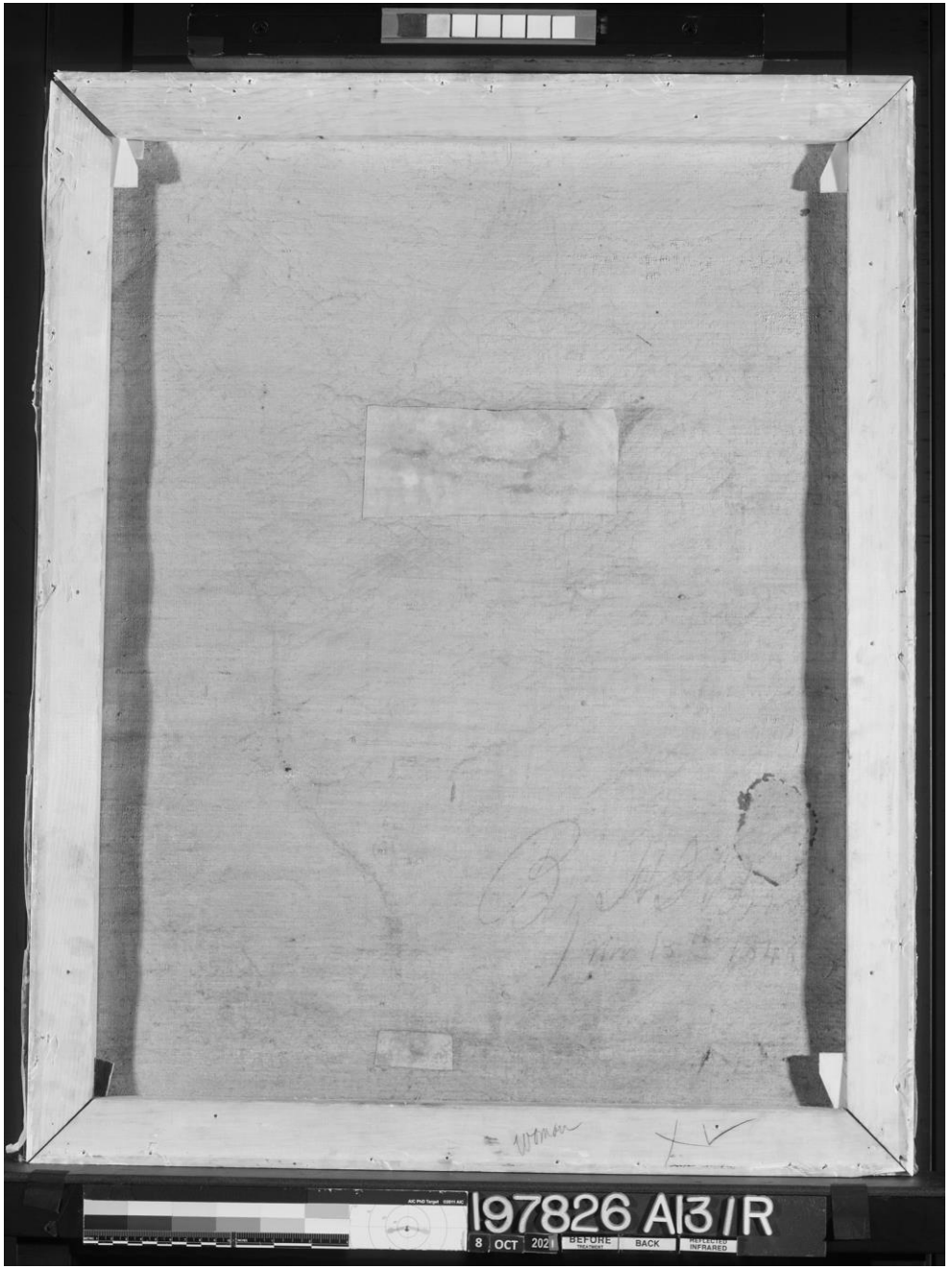
197826_A7SP_focus-blended

197826_A9TR_merged

197826_A10UVA

197826_A11UVA

197826_A12RIR



197826_A13RIR

197826_A15IRTR_merged

197826_A14IRLUM_780

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PAINTINGS TREATMENT REPORT **CNS 197826**

OWNER/AGENT	[redacted]
OWNER'S ID NR.	
DATE RECEIVED	September 27, 2019
EXAMINER	Camille Ferrer
FACULTY SUPERVISOR(S)	Fiona Beckett
DATE OF REPORT	June 8, 2022

ARTIST/MAKER (Owner's Attribution)	Unknown
SIGNATURE and its LOCATION	
TITLE	Portrait of a Woman (Elizabeth "Betsy" Edwards Harvey)
DATE	1840s
STRUCTURE	Oil on canvas
DIMENSIONS (H x W x D)	35 ½" x 29 ½" x 2 $^{3}/_{8}$" (in frame) 30 $^{1}/_{8}$" x 24 $^{1}/_{16}$"x $^{13}/_{16}$" (without frame)
ACCESSORIES	Gold painted frame with repeated foliage pattern.

I. OBSERVATIONS DURING TREATMENT

A significant amount of overpaint on the face was able to be removed. However, there are still remnants of it on the cheeks, nose, proper right eye and forehead. Both on the top of the hand and on the middle of the face there is an unknown discoloration, most likely from a previous treatment, that appears darker than the original skin tone. Despite testing with various methods, the discoloration remains present.

The overpaint in the background was difficult to solubilize. Several of tests were performed on the overpaint on the background since solvents did not have the desired effect as it did on the face. As the cleaning pursued, the more complex the overpaint removal became. Multiple solutions were used depending on how the overpaint behaved. The artwork was inspected with UVA lamps during the process to track the overpaint removal. Despite reducing the overpaint, it was not possible to safely remove all the overpaint. It was greatly reduced but the overpaint is still present in several areas in the background and the garment. It was decided to not remove the overpaint completely to reduce further risk to the original paint.

II. TREATMENT PERFORMED

1. Before, during, and after treatment written and photographic documentation was performed.
2. The backing board and painting were removed from frame.

3. Performed aqueous solubility tests to determine best way to clean pictorial surface.
4. Removed dirt and grime from pictorial surface using 1% Tri-Ammonium Citrate and rinsed with Distilled water on swabs.
5. Performed solubility tests in small areas to determine if safe to use on pictorial layer: odorless mineral spirits, mineral spirits, xylene[1],isopropanol, toluene, and ethanol[2] in varying proportions. The varnish was soluble with both isopropanol and ethanol. Testing with ethanol resulted with some overpaint removal in select locations, however the original paint was stable. Removal of varnish proceeded cautiously due to the extreme damage and overpaint on the portrait.
6. Small samples for cross-sectional analysis were taken under a microscope using a scalpel.
7. The varnish was removed with ethanol: odorless mineral spirits (2:1) solution, ethanol, and, isopropanol. Ethanol: odorless mineral spirits solution also removed some of the overpaint around the neck and face.
8. Constant solubility testing performed throughout treatment due to complex paint surface and the troublesome overpaint.
9. Tape on right tacking edge was mechanically removed with a spatula and scalpel. The canvas under the tape was extremely brittle, therefore removal proceeded with caution. While extreme caution was used, unavoidable minor losses occurred during the removal process.
10. The tacks and painting were removed from stretcher. The stretcher was saved, and tacks were discarded as they were rusted, unsuitable to support the painting and not original.
11. The tacking edges were humidified with a dampened blotter[3] and encouraged to flatten with slight manual pressure. Tacking edges left under weights overnight to completely flatten.
12. A temporary edge lining was prepared using Hollytex[4] and BEVA film[5]. Once prepared, Hollytex edge lining was attached to the reverse of the canvas with a tacking iron.
13. The previous tear repair patches on the reverse were mechanically removed. After solubility testing, the adhesive used for the previous tear repair resulted to be water soluble. To reduce the exposure of moisture to the painting, Gellan gum gel was used to soften the adhesive. Once

[1] XYLENE Xylenes, mixture of ortho, meta, and para isomers and may contain some Ethylbenzene, Fisher Scientific Company, Pittsburgh, PA 15219.
[2] ETHANOL, Fisher Scientific Company, Pittsburgh, PA 15219.
[3] THIN BLOTTING PAPER 100% cotton, acid and lignin free, without optical brighteners, 30 pt., Talas, Brooklyn, NY.
[4] HOLLYTEX (spun bonded, non-woven polyester) Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[5] BEVA FILM (an ethylene vinyl acetate based dry film adhesive) Conservator's Products Co. (CPC), P.O. Box 601, Flanders, NJ 07836. 973-927-4855

softened, the adhesive was removed using a scalpel. Not all of the adhesive could be removed. Adhesive sample taken for FTIR analysis. M-Transmission FTIR Microscopy data revealed the adhesive to be wheat-starch paste.

14. The artwork was attached to a temporary stretcher with staples[6].
15. The painting was humidified with suction heat table. A Dahlia sprayer with DI water was used to dampen a fiberglass[7] fabric. The fabric was placed under the painting along with a Pecap[8] polyester screen to prevent adhesion. A large piece of Mylar[9] was placed on top covering the whole suction heat table to mimic a humidification chamber. A hygrometer was placed next to the painting to monitor the relative humidity. The table was heated around 115°F. The painting was left to humidify for 10 minutes under constant observation. Slight condensation occurred around the perimeter of the painting due to moisture going through the Hollytex. The mylar was lifted occasionally to circulate the air around the painting to decrease condensation and keep the relative humidity under 80%. After humidifying for 10 minutes, the dampened fiberglass fabric and polyester screen were replaced with Schweitzer[10] paper to remove the excess moisture and prevent the painting to adhere on the table. With the heat still on, the painting was left with low suction under the mylar for 20 minutes. Afterwards, the heat was turned off. To remove excess moisture from the painting, the suction was left on for another 20 minutes.
16. The painting was examined under UVA with Wildfire Longthrow High Pressure Mercury lamp to determine other possible overpaint locations. Overpaint was confirmed to be also present on background and garment after comparing results from UVA examination, cross-sectional analysis and XRF mapping.
17. Solvent solubility tests were performed to determined appropriate method to remove overpaint. In order: odorless mineral spirits (2:1) solution, ethanol, 2% benzyl alcohol in ethanol solution,

[6] STAPLES (stainless steel or monel T-50) Arrow Fastener Co., 271 Mayhill Street, Saddlebrook, NJ 07633. (available from many hardware stores)
[7] FIBERGLASS fabrics: style #1581 (twill weave greige finish), #116 (fine plain weave I-627 finish), #7628 (average plain weave I-627 finish); Burlington Glass Fabrics Division, P.O. Box 21207, Greensboro, NC 27420.
[8] PECAP Tetko Pe-Cap 7-60HD (polyester monofilament screen printing fabric) Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[9] MYLAR Type D [clear] (polyester film), 1, 3, & 5 mil thick (1 mil = .001") *now known as Mitsubishi Hostaphan 43SM or Dupont Melinex type 516 or 456, since the brand Mylar-D has been discontinued as of 2001, although the name "Mylar" continues to be used*; available from Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770; OR: Archivart, Division of NielsenBainbridge, LLC, 40 Eisenhower Drive, Paramus, NJ 07652. 800-804-8428
[10] WET STRENGTH PAPER style # 318 (abaca fiber + unknown fibers + water resistant sizing: a.k.a. tea bag paper) Schweitzer Paper Co., Lee. MA. Available from: Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770

acetone[11], and 10% benzyl alcohol in ethanol solution. All resulted to solubilize overpaint without disturbing the original paint. 10% benzyl alcohol in ethanol solution was the most efficient amount the other solvents.

18. The painting was re-humidified with the same process as previously mentioned except for 20 minutes instead of 10.
19. Continued overpaint removal with 10% benzyl alcohol in ethanol solution.
20. While attempting to remove overpaint with tested solutions, there was no visible change on the background despite pigment being present on swab. To reduce constant solvent exposure and mechanical action, a selection of gels where tested to remove overpaint on the background. A Carbopol: Acetone gel (110mL Acetone, 1.2g Carbopol 934[12], 15mL Benzyl alcohol, 15 mL water, 4g ethomeen[13]) was tested and proved effective to remove large amounts of overpaint. The gel was placed on Japanese tissue paper[14] with a spatula and left on the pictorial surface for about 30 seconds. The residue was rinsed with DI water and xylene. Ethanol was later used to reduce blanching from residues.
21. The gel was switched to an Ethanol gel (100mL ethanol, 2g Carbopol, 2mL water, 7mL ethomeen) due to complexity of the overpainted surface.
22. Multiple solvent solutions continued to be used depending on how the overpaint behaved: 2:1 ethanol: odorless mineral spirits, 100% ethanol, ethanol with 2% benzyl alcohol, ethanol with 10% benzyl alcohol, and pemulan stock gel pH7 with ethanol. The artwork was inspected with UVA lamps during the process to track the overpaint removal and identify the original paint. Despite reducing the overpaint, there is still significant amounts left on the painting.
23. Regalrez[15] was brushed on the areas of loss.
24. Areas of loss filled with BEVA fills and wax carving tool. Xylene used to remove excess.

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[11] ACETONE Acetone, Fisher Scientific Company, Pittsburgh, PA 15219.
[12] CARBOPOL 934 (acrylic acid polymer) manufactured by Noveon; distributed by: Museum Services Corporation, 385 Bridgepoint Drive, South St. Paul, MN 55075; 651-450-8954;
OR Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[13] ETHOMEEN (alkaline surfactant: C-25 – polyoxyethylene(15)cocoamine; C-12 – cocobis (2-hydroxyethyl) amine) manufactured by Noveon; distributed by: Museum Services Corporation, 385 Bridgepoint Drive, South St. Paul, MN 55075; 651-450-8954;
OR Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[14] JAPANESE TISSUE PAPER Japanese paper, kozo fiber, thin weight.
[15] REGALREZ 1094 (a fully hydrogenated, low molecular weight hydrocarbon resin) Hercules Inc. Wilmington, DE 19894. available from Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770

25. Lascaux textile welding powder[16] was applied to the reverse of the tears to fortify the previous adhesion.
26. The temporary Hollytex edge lining was carefully removed with a tacking iron.
27. A canvas edge lining was prepared with a fine linen canvas[17]. The linen canvas was measured, frayed on the edge that is going to be attached to the painting, and ironed. A mylar was used to mark the border of the painting to know how the BEVA film should be cut. After the BEVA film was prepared, it was adhered to the reverse of the painting with a tacking iron. The painting was later edge lined with a tacking iron.
28. A vulcanized latex rubber sponge[18] was used to remove dirt and grime on the stretcher. The corners and edges were sanded into a round edge to reduce roughness, and splintering gouges were smoothed and repaired using clamps and fish glue[19]. The gaps in the mortises were filled with balsa wood[20] and a wax-resin mixture (beeswax[21]: W-445 microcrystalline wax[22]: Zonarez 7085[23], 2:2:1) that could easily be removed with heat, and later sanded until level to increase structural stability. Loose keys were secured in place with the same wax mixture to prevent falling out in the future.
29. The tacking edges of the painting were carefully folded using a tacking iron and held in place on the stretcher with push-pins. The artwork was left in position overnight to slowly adjust.
30. The painting was re-stretched and re-attached to stretcher with new copper tacks[24] and a barrier circle of acid-free manila folder stock between the tacking margin and each tack. The lining canvas was kept with enough material to be able to re-stretch in the future if needed be. The lining was secured in place with tacks onto the reverse of the stretcher.

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[16] LASCAUX 5060 (polyamide textile welding powder) Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[17] LINEN (natural linen #444, 54" wide, plain weave, medium weight) The Ulster Linen Co. Inc., 383 Moffit Blvd., Islip, NY 11751; 631-859-5244
[18] SPONGE CLEANER (vulcanized latex rubber) [a.k.a. Gonzo or Smoke-Off brand sponges] Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770; or many specialty paint stores
[19] FISH GLUE HIGH TACK (extracts from cod fish skins, about 45% solids) Distributed by Lee Valley Tools, Ltd., 1080 Morrison Drive, Ottawa, Ontario, K2H 8K7 Canada.
[20] BALSA SHEET (endgrain balsa 0.25" thick sheets) Alcan Baltek Corporation 108 Fairway Court P.O. Box 195, Northvale, NJ 07647. 201-767-1400 *also available through local suppliers*
[21] BEESWAX (natural) Conservation Support Systems, P.O. Box 91746, Santa Barbara, CA 93190. (805) 682-9843. [manufactured by honeybees]
[22] WITCO MULTIWAX X145A:W445 [1:1]; (microcrystalline waxes) Conservation Support Systems, P.O. Box 91746, Santa Barbara, CA 93190. (805) 682-9843. [manufactured by Witco Corporation, Irvington, NJ]
[23] ZONAREZ 7085 (polyterpene resin) Arizona Chemical, 4600 Touchton Road East, Suite 1200, Jacksonville, FL 32246. *Not manufactured anymore.*
[24] TACKS, FREDRIX (copper plated hardened steel) Pearl Paint, 308 Canal Street, New York, NY 10013. 800-451-7327

31. A backing board composed of archival Blueboard[25] was attached to the reverse with screws and metal washers.
32. The painting was brushed varnished with 15% Laropal A81[26] in 3:3:4 shellsol[27] A100: Shellsol 340: Xylene with 2% Tinuvin 292[28] (measured by weight to the resin).
33. Dry pigments[29], Galdehyde (Laropal A81) inpainting resin and 1-methoxy-2-propanol were used to inpaint. Areas of remaining overpaint were re-integrated slightly during this process to achieve unity in the pictorial layer.
34. A final layer of varnish (15% laropal A81 in 3:3:4 shellsol A100: Shellsol 340: Xylene with 2% Tinuvin 292) was sprayed after inpainting.
35. The interior of the frame was slightly sanded to better accommodate the painting. Volara foam rabbet tape was adhered along the inside of frame's rabbet to prevent abrasion between the surface of the painting and the frame.
36. The painting was secured on the frame with metal brackets. New hanging hardware (D-rings) was attached to the back of the frame.

[25] BLUEBOARD an acid-free corrugated cardboard (paper board that is folded/shaped with parallel alternative ridges and grooves); University Products, 517 Main St., P.O. Box 101, Holyoke, MA 01041.
[26] LAROPAL A81 (condensation product of urea and aliphatic aldehydes) manufactured by Badische Aniline und Soda Fabrik [BASF], supplied by Conservation Resources International, LLC, 5532 Port Royal Road, Springfield, Virginia 22151; 800-634-6932 [703-321-7730]
[27] SHELL SOLVENTS (71, 340HT, 320, A100, TS28, TS28B, TS28R) Guard-All Chemical Co., P.O. Box 445, Norwalk, CT 06856; (203) 838-5515 **OR:** Conservation Support Systems, P.O. Box 91746, Santa Barbara, CA 93190. (805) 682-9843. [obtain product literature from manufacturer: Shell, 3200 Southwest Fwy., Suite. 1230, Houston, TX 77027; (800) 457-2866].
[28] TINUVIN 292 (hindered amine light stabilizer: HALS) Ciba-Geigy Corporation, Additives Division, Seven Skyline Drive, Hawthorne, NY 10532. available from Talas 330 Morgan Ave Brooklyn, NY 11211; 212-219-0770
[29] DRY-PIGMENTS -

- specialty and historical pigments - Kremer Pigments, http://kremerpigments.com/
- specialty and generic pigments – Natural Pigments, http://naturalpigments.com/default.asp
- specialty and generic pigments - Daniel Smith, http://www.danielsmith.com/

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TREATMENT REPORT—Analysis & Photography/Imaging **CNS 197826**

MATERIALS ANALYSIS

SAMPLE and LOCATION	ANALYTICAL METHOD	FINDINGS
Sample taken from paint loss around the tear of her hand.	Cross-section	Clear image of the layering structure of the painting. Layering structure composed of ground, paint layer, varnish, overpaint, and secondary varnish layer.
Sample taken from paint loss around the tear of her hand.	Cross-section	Clear image of the layering structure of the painting. Layering structure composed of ground, paint layer, varnish, overpaint, and secondary varnish layer. Overpaint and secondary varnish layer brushed over the tear.
Sample taken from the top center edge, next to the previous cleaning test spot.	Cross-section	Clear image of the layering structure of the painting. Layering structure composed of ground, paint layer, varnish, overpaint, and secondary varnish layer. Two cracks found on the paint layer. Overpaint and secondary varnish layer brushed over the cracks.
Sample taken from the bottom edge near the tacks.	Cross-section	Inconclusive.
Sample taken from painting surface around the cheeks.	M-Transmission Fourier Infrared Microscopy	Barium white, linseed oil, and titanium white.
Sample taken from painting surface on the bottom edge.	M-Transmission Fourier Infrared Microscopy	Bone black
Sample taken from darker yellow painting surface on the hand	M-Transmission Fourier Infrared Microscopy	Inconclusive. Orange shellac or tung oil.
Sample of the adhesive taken from the previous tear repair on reverse of canvas.	M-Transmission Fourier Infrared Microscopy	Wheat starch adhesive, natural resin, and zinc stearate.
Sample of ground taken from reverse of canvas	M-Transmission Fourier Infrared Microscopy	Lead (ii) carbonate, lead white.
Sample taken of area from shoulders to top of head.	X-ray Fluorescence Spectroscopy mapping	Barium, Titanium, Zinc, Cadmium, Lead, Mercury, Phosphorous, Calcium, Iron, and so on.

Physical Samples Removed

Cross-section of paint layer.	Number of Samples: 4
M-Transmission Fourier Infrared Microscopy of paint surface	Number of Samples: 3
M-Transmission Fourier Infrared Microscopy of adhesive on reverse of canvas.	Number of Samples: 1

M-Transmission Fourier Infrared Microscopy of ground from reverse of canvas	Number of Samples: 1

i.e.: cross-section, edge cut, etc.

PRE-TREATMENT PHOTOGRAPHS

No.	DESCRIPTION	TECHNICAL NOTES	COMMENTS
B1UVA	Front, normal illumination, during treatment, partially cleaned.	The subject was photographed in a darkened room while irradiated by a long wave ultraviolet lamp (blacklight). The ultraviolet radiation causes some materials in the subject to fluoresce (emit light). *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite CC1, PECA 918, and Kodak 2E filters*	Remnants of varnish still present after cleaning. Overpaint pigment on the face fluoresce dark blue-grey. Dark fluorescence on background and garment suggest surface being overpainted throughout.
B2N	Front, normal illumination, during treatment, partially cleaned.	Lighting approximates standard viewing conditions.	Areas with varnish removed are less saturated. Notice the change of skin tone and distinct overpaint on the face.
B3N	Front, normal illumination, during treatment, partially cleaned.	See B2N.	Artwork attached to the temporary stretcher. Notice overpaint reduced on the face. Lighter areas on the background are where overpaint has been reduced.
B4N	Front, normal illumination, during treatment	See B2N.	See above.
C1N	Front, normal illumination, during treatment, before visual compensation.	See B2N	Notice color saturation due to newly applied varnish layer. Fills placed on areas of loss.

POST-TREATMENT PHOTOGRAPHS

No.	DESCRIPTION	TECHNICAL NOTES	COMMENTS
D1N	Front, normal illumination, after treatment	Lighting approximates standard viewing conditions.	Note the reduced overpaint, color integration and overall aesthetic improvement.
D2N	Back, normal illumination, after treatment	See D1N.	The backing board was attached.
D3RK	Front, raking illumination, after treatment	The light was positioned at the left, at a low angle to the surface of the painting in order to emphasize the surface topography.	Note the reduced canvas distortion. Also, note cracked paint layer throughout.
D4SP	Front, axial specular illumination, after treatment	The light was positioned adjacent to the camera to create specular reflections on the surface. These reflections provide information about surface characteristics (e.g. matte vs. glossy) as well as information about surface topography (dents, bulges, cracks, etc.)	Note even gloss throughout.
D5SP	Front, oblique specular illumination, before treatment	The subject was photographed at an oblique angle opposite the light source. The reflection of the light off the surface provides information about surface	See D4SP.

		characteristics (e.g., matte v glossy) as well as information about surface topography (dents, bulges, cracks, etc.)	
D6UVA	Front, longwave ultraviolet (UVA) induced visible fluorescence, after treatment.	The subject was photographed in a darkened room while irradiated by a long wave ultraviolet lamp (blacklight). The ultraviolet radiation causes some materials in the subject to fluoresce (emit light). *Camera filtration:* *UV-Vis-IR modified Nikon 810 with X-Nite CC1, PECA 918, and Kodak 2E filters*	Note the original natural varnish fluorescing green underneath the dark areas of overpaint. Also, note the inpaint materials applied doesn't fluoresce and appear darker than the present overpaint.
D7N	Front, framed, normal illumination, after treatment	See D1N.	Note artwork attached to frame.
D8N	Back, framed, normal illumination, after treatment	See D1N.	Note artwork attached to frame with new hardware.

197826_B2N

197826_B1UVA

197826_B3N_focus_blended

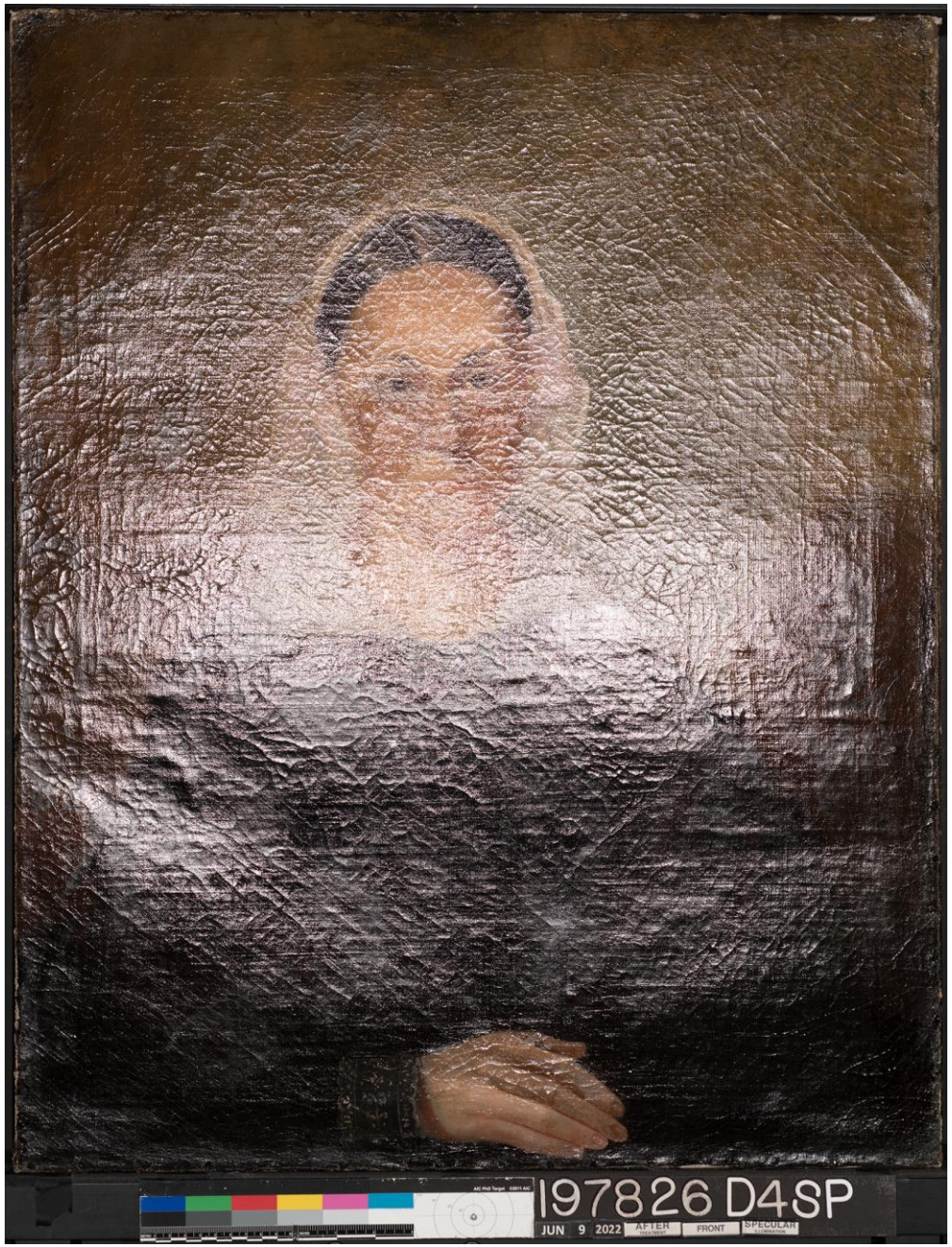
197826_B4N

197826_C1N

197826_D1N

197826_D2N

197826_D3RK



197826_D4SP

197826_D5SP_focus-blended

197826_D6UVA

197826_D7N

197826_D8N