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Retreating From Wax:
Investigation and Re-Treatment of a Painting Exhibiting Strange Surface Effects
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ABSTRACT

Surface hazing occurring on a recently treated painting called into question the methods used in its treatment, and offered an opportunity for research, analysis, and reflection on the field of paintings conservation. *Portrait of Millard Fillmore* was treated at Buffalo State College’s Art Conservation Department in 1996 and given a thorough treatment that utilized wax to re-line the canvas and to fill losses. The canvas was lined to fiberglass fabric and backed with Mylar, and a complex varnish schema was used: three varnishes were applied, all of which were soluble in low polar solvents. Suspecting that any number of factors from the painting’s previous treatment might have caused the surface hazing, the painting was analyzed using imaging techniques, FTIR, and Py-GC-MS. Analysis was inconclusive, but the cause of the surface issues seem likely to be related to varnish application, incomplete varnish and wax removal, and/or a swift migration of wax to the surface. Confident that the issue was simply a surface one, treatment proceeded; varnish was removed, the lining was reversed, the painting was re-lined to linen and aesthetically integrated in preparation for its return to exhibition. Although treatment was relatively straightforward and analysis did not identify a clear cause of the surface hazing, this painting represents an opportunity to examine the way we think about treatment. This is particularly interesting as such treatments that may well become more common in the future.

I. INTRODUCTION

In 1996, a large half-length portrait of Millard Fillmore was treated by a Buffalo State College Art Conservation Department student. In 2011, the painting was returned to the Department for re-treatment, at which point marked surface issues were already present. While the painting was structurally sound, the varnish was intermittently matte and slightly tacky overall, attracting a great deal of dust (Image 1).

*Image 1:* Before treatment, specular edge lighting allows a clear view of surface hazing.
When it was treated in 1996, the painting was given an interventive treatment that was necessary given its damaged state upon arrival (a delaminating wax-resin lining, no tacking margins, tears, tenting and lifting paint). This treatment, tailored to the issues found in the painting, was designed creatively, modifying established treatment methods to fit the artwork’s specific needs. While the treatment was devised with the best intentions, it may have ultimately created new problems. Creativity is necessary in a field in which tools and materials are often adapted from other industries, but it can be an issue when these materials and techniques, perhaps untested for their new context, do not hold up over the long term.

Many times, an artwork’s previous treatment is an unknown, and we cannot say what caused the painting’s current condition. In this case, however, we have highly detailed documentation, which allowed for an informed investigation into the factors that may have contributed to the painting’s current state. During its 1996 treatment at Buffalo State College, the painting was wax-lined to fiberglass cloth, backed with 5 mil Mylar, and varnished with a variety of resins, both natural and synthetic (dammar, Acryloid B-67, and Regalrez 1094), many of which were adjusted with the addition of the hindered-amine light stabilizer (HALS), Tinuvin 292. A few possible causes for the hazing came to mind:

B-67 is a polymeric varnish that fell out of favor due to its tendency to crosslink very gradually upon aging, often remaining somewhat tacky. No published research exists discussing B-67’s properties when layered beneath another varnish, but it is possible that residual tack, complications in layering the varnishes, or other physical properties of the B-67 resin may have created the surface issues. In addition, the possibility that Tinuvin 292, which is known to lower the glass transition temperature of varnishes, may have been added in excess or may have migrated to the surface was also a taken into account (De la Rie, 1990).

The third possibility, which seemed most likely to be the cause of the surface problems, was that wax, a mixture of two microcrystalline waxes and a beeswax, which was applied generously in the lining of the painting, remained on the surface of the painting before varnishing, or migrated through cracks in the painting to deposit and bloom on the surface after varnish application. The migration of wax, not entirely unheard of in paintings conservation or industry, may have been encouraged by
several factors, namely the impermeability of the Mylar backing and the use of low polar solvents in application of all of the varnish layers.

It was with these possibilities in mind that the project began. It is rare that we as conservators get the opportunity to re-treat something that was treated so recently; this was an exciting opportunity to turn a critical eye towards ourselves and our treatment techniques of the recent past. It was hoped that the investigation of these techniques and materials would result not only in a better understanding of the factors that lead to the painting’s current condition, but that they would also help to inform retreatment of similar paintings in the future.

II. THE PAINTING

Millard Fillmore, the 13th President of the United States, was a native of Western New York. Although his short term as President is not well regarded, Fillmore remains an important figure for Buffalo and the surrounding towns, particularly East Aurora, where he made his home. Fillmore was the first president of the Buffalo Historical Society in addition to being a board member of several other local institutions; as such the painting holds a great deal of historical value to the region.

This particular painting depicts Fillmore seated at his desk, wearing a suit, and looking decidedly presidential, if a little weary. A red curtain is draped to the side, and his hand rests on the desk next to his leather-bound books. Painted in 1871, just a few years before Fillmore’s death, it may have been a direct portrait, or it may be based upon any of a number of photographs, prints, and paintings of Fillmore that exist in the public record. The artist, Augustus Rockwell (1822-1882), lived and worked in Buffalo for much of his life, and was an accomplished portrait painter, though he is perhaps more well known for his landscapes (Falk, 1985).

2.1 PREVIOUS TREATMENT AND DOCUMENTATION

The portrait was brought to Buffalo State College’s Art Conservation Department for treatment in 1995 with a variety of condition issues, including three tears, a delaminating previous lining, and some paint loss and tented cleavage (Image 2). Oil paint, applied thinly, was primarily in good condition, and the varnish was not particularly discolored. It was determined that the lining was contributing to the tenting paint, and would need to be reversed.
After surface cleaning and local consolidation, the lining of the painting was removed, and heat, suction, and solvent were used to remove excess wax-resin lining adhesive from the reverse of the painting. Tears were repaired, and the painting was humidified and flattened on the suction table, both to return planarity to the painting and to re-confirm the consolidation. Upon removal of the lining canvas, an artist’s signature was discovered on the reverse of the canvas. It was determined that the painting would need to be re-lined, and that a transparent lining would be more appropriate, in order to allow the signature to be viewed.

Next, the varnish was removed and the painting was prepared for re-lining. A temporary isolating and protecting varnish layer of Arkon P-90 was applied,¹ in order to allow for easy removal after lining. The reverse of the support was infused with molten microcrystalline wax: equal parts W-445, X-145A, and unbleached beeswax. A piece of 5mil Mylar and two pieces of fiberglass #7628 with weft directions crossed were adhered to the reverse of the painting using additional wax on the hot

¹ Two coats, spray applied, 15% Arkon P-90 in petroleum benzene. Arkon P-90 was an early low molecular weight resin proposed by Rene de la Rie for use in paintings conservation. It is similar to Regalrez 1094 in its easy and extended solubility in hydrocarbon solvents. Arkon P-90 has since fallen out of favor.
The lining required some adjusting after the first attempt, so the Mylar was removed, and the reverse of the painting was hand ironed locally to remove trapped air bubbles (Image 3). When the lining was deemed satisfactory, the Mylar was re-attached with more wax, and the painting was stretched onto a new, custom-made stretcher (see Appendix for complete images of the re-lining).

Arkon P-90 and excess wax were removed from the surface of the painting using petroleum benzine. The white painted areas were cleaned further using a solution of xylene : ethanol : water 10:15:2. The painting was varnished overall with dammar, losses were filled, textured, and inpainted, and the painting was varnished as follows: two coats of dammar, one coat of Acryloid B-67, and two coats of Regalrez 1094 (see Image 4, and Figure 1 below).

The painting was returned to its owners in 1998, where it was kept primarily in storage. After only 13 years the surface was noticeably disfigured, and the painting was brought back for re-treatment.

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2 Poly(isobutyl methacrylate).
3 Regalrez 1094 is a fully hydrogenated oligomer of styrene and alpha-methyl styrene.
2.2 DECISION-MAKING

As with any conservation treatment, the materials and techniques used in the treatment of this painting were developed in order to preserve the integrity of the artwork, and were thought to be an adaptation of and improvement upon past techniques. The ideas of development and creativity are central to the conservation profession, but are also the subject of contention and criticism; when conservators use something that is untested, are they breaking new ground or being irresponsible? Conservators are conservative: we often feel pulled towards the known, the time-tested, and the safe rather than the new, the artificially-aged, and the cutting edge. However, we also recognize the need to move beyond the treatments that are standard when faced with a non-standard artwork. This conflict is not new, but it is still relevant.

It is not unusual to hear paintings conservators disparage some of the techniques used in the 1996 treatment of this painting. However, to blindly criticize this treatment is to ignore the fact that treatment techniques often age out of fashion rapidly. At the time, this treatment pushed some boundaries, but its basis for exploration was thoroughly placed within norms of the period, and it
was developed based on a desire to find a creative solution for this artwork. With that in mind, I’ll discuss some of the ideas that led to the development of this painting’s treatment.

Wax-resin linings have fallen under heavy criticism in the last 25 years, from a variety of sources, and for a variety of reasons. Alan Phenix summarizes the most widespread concerns well (27):

*The case against wax-resin lining is well-developed. The adhesive is an unsympathetic material, incompatible with the intrinsic object characteristics of canvas paintings. It is not an adhesive in the true sense of the word: it adheres by physical impregnation of the canvases, binding them together by virtue of its own cohesion. It impregnates all elements of the painting canvas, ground, even oil paint, and in so doing will have a darkening, saturating effect on all porous materials it impregnates […] Absolute reversibility may be impossible owing to the extent of impregnation.*

Wax-resin lining was a movement, of sorts, largely led by Caroline and Sheldon Keck of the Cooperstown conservation program. At the time, paintings were often lined as a preventive measure, leading to irreversible changes in many cases. However, the technique does have benefits, namely effective overall consolidation, and low reactivity to wide changes in temperature and relative humidity after lining.\(^4\) Wax and resin are infused into the canvas during these linings, darkening the canvas and, occasionally, the paint as well; recipes varied widely between conservators, but often included beeswax, microcrystalline wax, natural resin or resins, and Canada balsam (Phenix, Boissonnas). Generally, recipes contained between 10-40% resin, with the resin providing much of the stiffness (Phenix). Today we see wax-resin linings as being highly interventive and creating an undesirable permanent change to most paintings, both in color and texture (Bomford, Staniforth).

Lining of paintings to transparent supports such as fiberglass and Mylar, was quite popular in the mid to late 20\(^\text{th}\) century. The use of transparent supports was first proposed by Sheldon Keck in 1940 (Albano), followed by the publication of thorough instructions for wax-resin infusion of fiberglass by Alain Boissonnas in 1960 (Boissonnas). Early treatments involving the lining of a painting to

\(^4\) Particularly in comparison to glue-paste linings (Phenix).
fiberglass backed with Mylar using Beva 371 was also detailed by Gustav Berger in 1976 (Berger). In some respects, the appeal of transparent linings still holds strong today, particularly in regards to paintings with inscriptions or details on the reverse. However, issues with transparent lining materials (Phenix), and a desire for minimal intervention has led to fewer overall linings in recent years, and new methods of achieving transparency in lining (Ackroyd).

While some conservators abandoned wax-resin linings (or linings) entirely, some continued to use it, and some modified it as they felt was necessary and appropriate. Having been previously wax-resin lined, Portrait of Millard Fillmore was a strong candidate for another wax-resin lining or for a BEVA lining. A modified wax-resin technique was chosen, and the painting was lined with a mixture of three waxes, each carefully chosen for its working and aging properties. The combination of these waxes, it was hoped, would mimic a wax-resin lining without need for the resin, which was thought to be the least soluble, reversible, or re-treatable of the materials at play in the wax-resin lining. Resin yellows and embrittles, oxidizing over time and becoming difficult to remove. In contrast, the waxes chosen for the lining and infusion were sticky, less yellowing, and would remain easily removable with heat. Multiwax W-445 and X-145A are both high molecular weight microcrystalline waxes, chosen for their long term chemical stability and tack. Although this was not a standard treatment practice, the plan was derived from the practical and theoretical basis for established techniques, and was a creative attempt at improving the range of current options.

Similarly, each layer of varnish was applied for a specific purpose. Arkon P-90 was used as an isolating and protecting varnish layer because of its ready solubility in the hydrocarbon solvents that would also be used to clean excess wax from the painting’s surface, and to facilitate removal of the facing. Next, dammar was applied, as a solid base varnish with known solubility and aging properties. Dammar sank in, however, giving an uneven saturation. Following standard practice for this situation, B-67, a long-chain polymeric varnish, was applied in order to facilitate uniform varnish saturation. Finally, Regalrez 1094 was applied as a topcoat, in order to give a more traditional, glossy look to the varnish. Regalrez 1094 was chosen for its spectacular aging properties;

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5 Wax is difficult to remove entirely from an impregnated painting, so a sympathetic material is useful to attain proper adhesion. BEVA 371 contains a wax component, and is therefore an effective adhesive in this case.
while the stability of the other varnishes used have been questioned over the years, Regalrez is still held up as an ideal varnish in terms of long-term stability (Samet).

The varnish schematic makes sense from a practical standpoint. Materially, however, it becomes somewhat problematic. Each varnish was applied using a low-polar hydrocarbon solvent, essentially making a thin poultice on the surface of the painting until the solvent evaporated (likely a long time, since most of these solvents have a low vapor pressure). This prolonged, repeated poulticing of the painting, combined with possible residue from Arkon P-90 and wax, may have strongly contributed to wax migration through the painting, and may have resulted in a complex zone of interaction among the varnish layers.

2.3 2014 CONDITION AND DOCUMENTATION

When the painting was brought in for re-treatment in 2011 it was found to be in great condition structurally. The stiffness of the Mylar backing on the fiberglass lining canvas kept the painting well tensioned and planar. Paint appeared to be stable, slight cupping was not distracting under normal illumination, deceptive retouching still matched, and the repaired tears were holding well. However, the varnished surface of the painting was noticeably hazed in irregular patterns and had developed a tacky surface, which in turn lead to a marked propensity for attracting dust. The surface hazing was present throughout the painting, except for areas that had been filled and inpainted. This was surprising, and suggested that the source of the problem might not be the varnish alone, but could be directly related to the wax lining.

Upon examination under the microscope, it became apparent that the hazed areas primarily correlated to cracks in the paint surface; even those areas that appeared to be large, irregularly shaped patches of surface haze were found to have formed over a finely developed network of cracks. The hazed areas, which at this point were strongly suspected to be wax, were spreadable with
slight pressure, and left streaks across the surface of the painting. The surface of the hazy areas was also quite easily marred with a fingernail or bamboo skewer, and even the glossy areas maintained some tack overall. It was clear that regardless the cause of the hazing, the top layer of the varnish would need to be removed. Treatment and analysis proceeded from this point.

2.4 RESEARCH/MATERIALS AND TECHNIQUES

When approaching the retreatment of Portrait of Millard Fillmore, a few questions directed the approach: Could wax have migrated along cracks and through the varnish layers? Could the varnishing system be responsible for the wax migration? Could the layered varnish system itself be responsible for the hazing? If wax migrated, then is it possible to varnish wax-lined or wax-resin lined paintings with low-molecular weight varnishes applied in hydrocarbon solvents without encouraging migration? Expecting that many, if not all, of these questions would remain difficult to answer with any certainty, research began to determine the cause of the hazing. It was understood that it might be impossible to distinguish between similar materials, such as Regalrez and waxes, and that the structure of some of these materials was not yet entirely understood (Bonaduce).

First, the painting was examined and documented using visible light and ultraviolet-induced visible fluorescence. Following visual analysis, portable Fourier transformation infra-red spectroscopy (FTIR) and pyrolysis gas chromatography-mass spectrometry (Py-GC-MS), were used in an attempt to quantify the difference between the hazed and matte areas.

2.4.1 Imaging

Examination with visible light revealed the extent of the disruptions that had occurred to the painting’s surface. Raking light showed severe dust accumulation due to the painting’s tackiness, while specular edge illumination showed the intermittent surface gloss that was so distracting.
Examination and subsequent documentation using a binocular microscope revealed the sensitivity of these hazed areas: they were soft, malleable, and easily disrupted using light pressure from a bamboo skewer. Light raking across the surface of the hazed areas did not give an indication of an appreciable difference in height between the areas, however, and examination under ultraviolet illumination (UV) did not reveal a visible difference between the matte and glossy areas (Image 6). The similar appearance of these areas under UV indicated potential material similarity, and was the first hint that simple wax migration may not have been the cause of the painting’s current state.

2.4.2 FTIR
Initially, attempts were made to run samples of the hazed varnish areas using a tabletop FTIR in transmission mode. However, perhaps due to difficulty in sampling only the surface of these areas, a variety of materials were detected, indicating a sampling of several different varnish layers. The portable FTIR unit was chosen instead for its ability to scan objects in situ.\(^6\) The FTIR unit was positioned close to the painting, which was propped upright. A variety of areas and colors were analyzed and imaged by the instrument.

Spectra were overwhelmed by a large carbonyl peak that pointed towards the presence of an acrylic resin; these peaks were consistent with iso-butyl methacrylate, the base component of B-67. The first two samples taken were particularly clear in their identification of B-67. This was surprising, since B-67 was used beneath Regalrez 1094, and was not expected to show strongly in any of the areas scanned. The other samples primarily showed peaks consistent with a wax or hydrocarbon chain, indicating either the presence of wax or Regalrez. FTIR is unable to distinguish between types of waxes or wax-like varnish materials, however (Bonaduce). Since this was the primary interest of the research, another instrument was necessary, and analysis turned towards GC-MS.

2.4.3 GC-MS
\(^6\) Infrared spectra were collected using a Bruker ALPHA FT-IR spectrometer with a module for external reflection and an integrated video camera allowing for non-contact analysis. No sample preparation was needed. The spectral range was 400 – 4000 cm\(^{-1}\) with a 2 mm spot size collecting data at a 15 mm distance from the instrument window. The spectra are the average of 32 scans at 4 cm\(^{-1}\) spectral resolution. A Kramers-Kronig transformation was used to remove the refractive index contribution from the spectrum using OPUS software (Bruker). The Kramers-Kronig transformation is a useful tool, but may modify the spectral information somewhat, and does not give exact answers. 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).
Two samples of hazed varnish areas were run using GC-MS. Samples were obtained using a bamboo skewer, which was run lightly over the surface. Working gently with the soft skewer, it was presumed that only the malleable hazed areas of the varnish would be sampled. Samples from a red and black area of paint on the right side were both analyzed (Appendix II). For comparison, a sample of Regalrez was also run using the same method.

Analysis of the black matte sample revealed a large amount of isobutyl methacrylate, presumably from the B-67 varnish layer. Regalrez was suspected, but was impossible to identify with certainty, as contamination from the column made identification of small peaks difficult. The red matte sample displayed similarly large peaks for isobutyl methacrylate (B-67), and displayed peaks that were clearly aligned with those expected from Regalrez 1094. The presence of wax or Tinuvin 292 could not be confirmed in either sample.

2.4.4 Conclusions

Both FTIR and GCMS analysis confirmed the presence of the varnishes known to have been applied to the painting. Both techniques detected varnish layers below the topmost layer, either indicating sampling that dipped below the surface, or a complicated transition between and interaction of varnish layers. In addition, FTIR and GC-MS were unable to confirm the presence of wax. Unfortunately, column contamination contributed to spectral noise and made identification and differentiation of very small peaks impossible. We may not have ruled out the role of wax entirely even though it did not show up clearly in the GC-MS spectra. In addition, analysis did not give any clues as to what sort of varnish interaction or wax interaction beneath the surface might have caused.

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7 A Frontier Lab Py-2020iD double-shot pyrolyzer system was used for pyrolysis, and the pyrolysis interface was maintained at 320°C. The pyrolyzer was interfaced to an Agilent Technologies 7820A gas chromatograph coupled to a 5975 mass spectrometer via a Frontier Vent Free GC/MS adapter. An Agilent HP-5ms capillary column (30 m x 0.25 mm x 0.25µm) was used for the separation with He as the carrier gas set to 1 mL per minute. The split injector was set to 320°C with a split ratio of 50:1 and no solvent delay was used. The GC oven temperature program was 50°C for 2 minutes, ramped to 300°C at 10°C per minute, followed by a 5 minute isothermal period. The MS transfer line was at 320°C, the source at 230°C, and the MS quadrupole at 150°C. The mass spectrometer was scanned from 33-600 amu at a rate of 2.59 scans per second. The electron multiplier was set to the autotune value. Samples were placed into a 50 µL stainless steel Eco-cup, an Eco-stick was fitted into the cup, and the cup was placed into the pyrolysis interface where it was purged with He for 3 minutes. Samples were pyrolyzed using a single-shot method at 600°C for 10 seconds. Sample identification was aided by searching the NIST MS library.

8 Contamination of the gas chromatography column led to an array of erroneous peaks in the samples. The instrument could not be completely purged of these impurities during the time of this project. The small nature of these samples is somewhat problematic in areas where small peaks cannot be certainly distinguished from the baseline of the column’s contaminants (achieved by collecting data from an empty sample cup). Some peaks cannot, therefore, be identified with the degree of certainty that was hoped for. The conclusions discussed below are based on only those peaks that are clearly unrelated to the column’s contaminants.
the varnish to change so dramatically in such a short period of time. For access to spectra and more information about analysis, please contact the author.

III. 2015 TREATMENT

Analysis complete, little more was known or understood about the cause of the painting’s surface condition. However, the painting clearly required varnish adjustment, and good practices dictated that any questionable materials be removed from the painting. With that in mind, a treatment was proposed that included varnish removal, lining removal, and re-lining using a contemporary lining technique.

Varnish removal was somewhat complicated by the solubility of each distinct varnish layer and wax in the same solvents. Using a variety of low-polar, low-aromatic solvent solutions, the varnish was reduced overall instead of unpacked layer by layer (Image 7). Next, the lining was reversed: the painting was removed from its stretcher, the lining tacking margins were flattened and the painting was placed face-up on the vacuum hot table. The table was warmed until the wax holding the lining together became malleable, then the lining was separated using a taught linen cord that was drawn behind the original canvas (Image 8).

After separation, the canvas still retained large amounts of wax. The painting was warmed under slight pressure on the vacuum hot table three more times over multiple layers of plain-weave fiberglass in order to draw residual wax out of the canvas. Finally, it was placed face-down and a low-polar, low-aromatic solvent solution was used to remove as much wax as possible from the reverse of the painting.

Image 7: During varnish removal.

Image 8: Reversing the lining by drawing a taut string between original and lining canvases.
This treatment of the painting’s reverse resulted in a dramatic lightening of the canvas, with improved legibility of the artist’s signature (Image 9). It also revealed a faint stamp, placed just above the signature: “PROPERTY OF THE BUFFALO FINE ARTS ACADEMY”. The Buffalo Fine Arts Academy, founded in 1862, is one of the country’s oldest public art institutions, and is now known as the Albright Knox Art Gallery (History, 2015).

Next, excess wax and varnish were removed from the surface of the painting using solvents. A great deal of wax was removed, but some clearly remained incorporated into the canvas; this is not ideal, but also not surprising, as the retention of some wax is inevitable after infusion (Phenix).

Finally, the painting was re-lined to linen using BEVA film. Although the presence of a signature on the reverse of a painting would typically call for a translucent lining material to allow for it to be seen, the previous infusion of the canvas with wax had led to such a severe darkening as to make the signature invisible without the aid of infra-red imaging or photography. A similar infusion of the canvas at this point would likely result in a similar illegibility of the signature. A middle ground was found: the signature was documented using visible light and reflected infrared photography, and an encapsulated archival print of the imaged signature was placed on the painting’s backing board.

The lining process did not go as smoothly as was hoped, and was complicated by issues with BEVA film, the chosen lining material, which took this treatment on a bit of a detour into the formulation of BEVA 371. The recipe of BEVA has changed in the last five years; new BEVA has slightly different working properties that have been well-studied (Ploeger), however, the working properties of the new BEVA in film form have not yet been subjected to similar rigorous study.

When preparing the lining canvas with two layers of BEVA film, these changes were seen firsthand. The hot table was brought up to 170° F, and rather than sitting proud of the canvas, tacky and ready to receive the painting, the BEVA film sunk into the canvas. Originally, the painting was to be lined through “slide lining”, in which the painting is slowly placed onto the tacky BEVA film, held under
vacuum with heat for a few minutes, then placed under weight to cool. Such linings require little heat on the painting, and create more of a nap bond rather than an infusion since the BEVA film is ideally not brought up to temperatures at which it can flow. The strange behavior of the new BEVA film may make this type of lining difficult or impossible in the future; it is something to be studied in greater depth at another time.

The flowing of the two layers of BEVA film into the canvas was used as a base, and a third piece of BEVA film was laid on top and held into place with slight heat and vacuum. The painting was registered on the BEVA film on the hot table; the table was brought up to 155°F with vacuum pressure at 1” Hg. This time, the lining was successful, although it involved slightly greater heat and pressure than had been planned initially.

Finally, the painting was re-stretched, varnished, and given minor aesthetic compensation to mask tears and losses.

IV. RESULTS AND CONCLUSION

*Portrait of Millard Fillmore* initially seemed to be a relatively straightforward treatment: surface hazing or blooming was assumed to be entirely due to wax migration or interaction within the surface. Ultimately, the results of analysis were inconclusive, and somewhat surprising. Expecting to find that wax was the culprit, a more complicated picture developed in which both wax and varnish could be to blame. Many new questions have been raised by this investigation, particularly in regards to the long-term stability of the layering of synthetic varnishes with similar solubility parameters.

While this project certainly requires more investigation in order to have a more complete understanding about the variety of interactions that may have taken place between wax, varnish, solvent, and Mylar, it still serves as a fascinating example of how relatively simple conservation treatments can have far reaching and complicated consequences.

Due to a variety of factors, conservators spend much of their energy re-treating art that was conserved in the relatively recent past, and it is likely that the next few decades will require a great
deal of re-treatment of wax-resin and wax lined painting, some of which may display similar issues to this one. When conservators tailor treatments to objects, standard practices are regularly modified to fit the situation. While it is important that we can fit our treatments to the needs of individual artworks, this practice results in a wide range of treatment variations that push the boundaries of what is studied, occasionally leading to unknown long-term effects. While not ideal, these treatments, if well documented, can be useful, since often it is when materials fail that we truly learn their limits and uses.

Throughout this project, it became clear that conservation documentation is of the utmost importance. If not for its accompanying documentation, this painting might not have gotten the full treatment that it needed or deserved. Hopefully, Portrait of Millard Fillmore will not return to Buffalo State College’s Art Conservation Department for quite some time; when it does, however, hopefully this project and its documentation will prove useful to its future conservator.

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REFERENCES


AUTOBIOGRAPHICAL STATEMENT

Anne Schaffer earned her BA in Visual Art and Chemistry from Bennington College in Bennington, VT, with additional coursework at Studio Art Centers International in Florence, Italy. Before beginning graduate work in Art Conservation, she held pre-program internships at the Fine Arts Museums of San Francisco, Williamstown Art Conservation Center, Higgins Armory Museum, and Baltimore Museum of Art, in addition to work in private practice. She completed a graduate summer internship in 2014 at ICA – Art Conservation in Cleveland, OH and in 2015 at the Menil Collection in Houston, TX before beginning her third year graduate internship at the Philadelphia Museum of Art. Anne expects to earn her MA and CAS in Art Conservation with a paintings specialization from Buffalo State College in 2016. Please refer questions to the author at schaffer.anne@gmail.com.
APPENDIX
PREVIOUS TREATMENT, 1996-8
1.1 DURING TREATMENT IMAGES

Image 1: The painting was registered with its new tacking margins. The canvas is already infused with wax in anticipation of lining.

Image 2: 5mil Mylar and cross-warp fiberglass pieces were registered and placed on the warm vacuum hot table. Linen tacking margins were placed between the two sheets of fiberglass, and the package was infused with wax.
Image 3: Wax being rolled onto the fiberglass, with the tacking margins blocked off with Mylar.

Image 4: The lining fabric thoroughly infused with wax.

Image 5: Linen tacking margins are now also infused with wax. The lining was placed under suction in order to ensure a thorough bond and even wax distribution.
**Image 6:** With the lining package held by heat and suction, a brayer was used to distribute wax across the lining canvas.

**Image 7:** The painting was registered face up on the lining. The painting cooled under suction in order to get a firm bond to the lining canvas.

**Image 8:** Afterwards, the painting was placed face down so that the lining could be evaluated. The opaque areas in the corners are indicative of insufficient adhesion.
Image 9: Air bubbles in the lining (due to insufficient wax application) required localized heat and pressure to dissipate. The Mylar was removed from the back in order to allow access to the bubbles.

Image 10: More wax was applied to the reverse of the painting in order to reduce air bubbles in the next lining attempt.

Image 11: After the wax was applied, the painting was fitted with a new sheet of Mylar, and placed under heat and suction again to confirm the lining. This time, the lining was successful and entirely translucent.