

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

DANA GOODIN

ABSTRACT—Recently two very different types of tapestries were cleaned with agarose gels at the Textile Conservation Laboratory of the Cathedral Church of St. John the Divine in New York City.

A set of six William Baumgarten tapestries, dated to the 1910s, had been subjected to the normal environmental fluctuations of a privately owned New York City townhouse for almost 100 years. Several water pipe leaks also left dark staining. The silk wefts were so desiccated that they were powdering, and the tapestries were far too fragile for immersive wet-cleaning. Agarose gels offered a safe and effective way of cleaning and conserving the tapestries.

The second case study is a multicolored wool Agam tapestry with a white cotton ground from the 1970s. It had large amounts of hard, yellow polymer glue in thick layers along the back of the top and bottom edges. Testing determined that the red and black yarns were not colorfast, excluding the possibility of aqueous cleaning. Agarose gels were used as a vehicle for the application of the amyl acetate, which was used to soften the glue, because the gels would allow for a targeted treatment that would reduce the amount of human contact with the amyl acetate.

AGAROSE DOS MANERAS: ÉXITOS Y DESAFÍOS EN APLICACIONES DE GEL A GRAN ESCALA

RESUMEN—Recientemente, se limpiaron dos tipos de tapices muy diferentes con geles de agarosa en el Laboratorio de Conservación de Textiles de la Catedral de San Juan el Divino.

Un conjunto de seis tapices de William Baumgarten, datados de la década de 1910, se había sometido a las fluctuaciones ambientales normales de una casa de la ciudad de Nueva York de propiedad privada durante casi 100 años. Varias filtraciones de tuberías de agua también dejaron manchas oscuras. Las tramas de seda estaban tan disecadas que estaban empolvadas, y los tapices eran demasiado frágiles para una limpieza húmeda inmersiva. Los geles de agarosa ofrecieron una forma segura y efectiva de limpiar y conservar los tapices.

El segundo caso de estudio es un tapiz de Agam de lana multicolor con un fondo de algodón blanco de la década de 1970. Tenía grandes cantidades de adhesivo de polímero duro y amarillo en capas gruesas a lo largo de la parte posterior de los bordes superior e inferior. Las pruebas determinaron que los hilos rojo y negro no eran resistentes al agua, excluyendo la posibilidad de una limpieza acuosa. Los geles de agarosa se usaron como un vehículo para la aplicación del acetato de amilo, que se usó para ablandar el adhesivo, ya que los geles permitirían un tratamiento dirigido que reduciría la cantidad de contacto humano con el acetato de amilo.

1. INTRODUCTION

The subject of this essay is the challenges and successes of using agarose gels in two tapestry conservation projects undertaken within the past few years at the Textile Conservation Laboratory at the Cathedral Church of St. John the Divine in New York City. The two projects, the conservation of a set of Baumgarten tapestries (fig. 1) and an Agam tapestry (fig. 2), required cleaning methodologies that did not include immersive wet-cleaning. Agarose gels were investigated as a possible method to clean the tapestries.

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS



Fig. 1. Three of the six Baumgarten tapestries in situ in the New York City townhouse, ca. 1910. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.



Fig. 2. A tapestry designed by Yaacov Agam, before treatment, ca. 1970s.

Although prior conservation case studies involving agarose gels as a textile cleaning method were consulted, there was a lack of published articles using agarose treatment on tapestries. For both the Baumgarten tapestries and the Agam tapestry, it was necessary to create a new protocol and methodology for using agarose gels on textiles that were both thicker and larger than the textiles in the earlier published agarose gel treatments. Both agarose treatments had successes and challenges, which were defined by the characteristics of the tapestries themselves.

2. BAUMGARTEN TAPESTRIES

William Baumgarten (1845–1906) founded his interior design firm and tapestry workshop in New York City in 1893 (Zrebic 1980). The firm was one of the first producers of European-style tapestries in the United States. Baumgarten is credited with designing the interiors of multiple homes for wealthy families, such as the Astor and Vanderbilt residences in New York City (Zrebic 1980). He is also credited with designing the interior of the William Welsh Harrison Grey Towers Castle, which is now part of Arcadia University.

In 2012 a set of six Baumgarten tapestries was discovered in a privately owned Upper West Side townhouse. The townhouse had been built and designed around the turn of the 20th century. The six tapestries had been installed within a wood-paneled room, in situ, and had remained there until their 2013 deinstallation. The room had been converted into a studio apartment rental with a small bathroom and kitchenette.

The six tapestries are in the popular 18th century *alentours* style, made famous by the Rococo painters Charles-Antoine Coypel and François Boucher (Hunter 1915). On the first tapestry treated, the workshop's signature "B/ N•Y" is located in the lower left-hand corner (fig. 3).



Fig. 3. Baumgarten's signature on panel 1. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

Through fiber microscopy it was determined that the tapestries have cotton warps and silk and wool wefts. Due to the environment of the townhouse and the initial poor quality of the silk, the silk is in an advanced state of deterioration.

2.1 CONDITION OF BAUMGARTEN TAPESTRIES

Since their installation the tapestries had been subjected to the normal environmental fluctuations of a New York City townhouse for over 100 years. All four sides of each tapestry were attached to the wall with hundreds of nails, limiting their movement. As a result, all of the tapestries suffered small splits from the expansion and contraction of the fibers caused by the temperature and humidity fluctuations in the room.

There were also several leaks from water pipes and outside walls that left dark staining (fig. 4).

The leaks had caused the plaster backings of the in situ frames to create white streaks visible on the surface of the tapestries, and close proximity to lamps had caused areas of discoloration and color change.

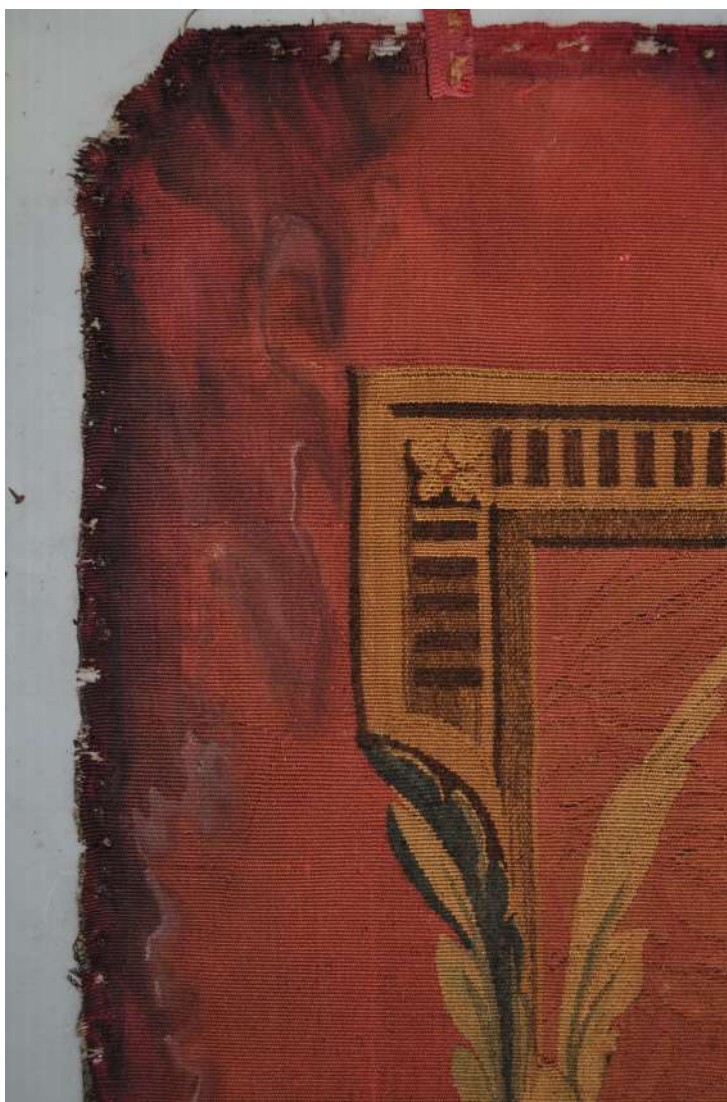


Fig. 4. Dark staining from leaks on the upper left corner of panel 1. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.



Fig. 5. Fallen linen lining, pushing through bottom of tapestry before deinstallation. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

There were areas of concentrated black particulate, and the colors of the tapestries appeared muted, dull, and even dark due to the century's worth of soiling embedded in the yarns.

The linen lining of one of the tapestries had detached and dropped to the base of the tapestry frame, pushing out through the bottom edge and severely tearing the tapestry in the process (fig. 5). Another tapestry had been torn to access an electricity box.

Additionally, the tapestries were all extremely dry and stiff. The silk used throughout the tapestries was desiccated and powdering upon touch. Gentle vacuum testing collected small piles of shattered silk fibers and dirt particulate. While samples were being prepared for fiber identification, they shattered into powder. After deinstallation, the tapestries were gently rolled and stored within a humidity tent set up in the laboratory (fig. 6). The humidity tent maintained a constant relative humidity of 52% to 58%.



Fig. 6. Panel 1 during treatment in the humidity tent. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

The first tapestry to be treated, panel 1, was unrolled and laid flat on a table for several months in the tent to allow it to rehumidify before treatment was attempted.

2.2 TREATMENT TESTING AND CONSIDERATIONS

Given the poor condition of the tapestry, the option of an immersive wet-cleaning treatment was immediately eliminated. The fear was that the powdering silk would simply wash away in the bath. Cotton linter poultices and gentle suction cleaning methods were tested, but it was determined that the standard poultice treatments were not effective. Agarose gels were tested as an alternative poultice, as they could possibly be used to target and spot-clean the most egregious surface staining. Recent research (Sahmel et al. 2012) into agarose gel cleaning techniques highlighted the ability of agarose gels to provide contained staining removal without the necessity of wetting the entire textile. However, in that study, the gels had primarily been tested on thinner textiles such as cotton samplers.

After further research and testing it was determined that an agarose gel treatment could potentially be beneficial for cleaning the entirety of the tapestry, as well as providing additional humidification to the desiccated fibers. The use of agarose gels is similar to the cotton linter poultices used for stain removal in textile conservation; however, the gels were investigated as an alternative because of their drape and flexibility, as well as their smooth surface. Cotton linters and gauze were briefly tested initially as poultice treatment vehicles; however, the linters were difficult to remove and left small particles behind that later had to be removed with tweezers. As the gauze dried it clung to the tapestry surface and its removal dislodged powdering silk fibers. There was concern that given the tapestry's condition, any additional surface manipulation would result in greater deterioration and further loss of the desiccated and powdering silk fibers.

2.3 AGAROSE GEL BACKGROUND

Agarose gels are rigid polysaccharide gels. The gels are formed when agarose powder, derived from certain strains of algae, is combined with water and brought to a boil (Warda et al. 2007). The gels can be cast in almost any thickness, shape, and size. Through capillary action, agarose gels can pull solubilized soiling and particulate matter out of a textile and back into the gel (Sahmel et al. 2012). A mild detergent, such as Orvus WA Paste, can be added to solution before the gels are cast to facilitate soiling removal (Mina 2015). Usually, the gels are cast at 2% w/v for slower solution release during testing but used in treatment at 1% w/v (Mina 2015). Ideally, the material being treated is smooth and is in a condition where it can be exposed to suction for rinsing. Unfortunately, because the tapestry was so fragile, suction would remove too much of the powdering silk fibers and would scratch the wet yarns. Therefore it was determined that agarose gels with deionized water would also be used to rinse any lingering detergent from the tapestry, instead of the more common suction rinsing.

2.4 AGAROSE GEL TREATMENT AND TESTING

Through testing, the density of the 1% w/v agarose gels was found to be too low for this treatment. Although the 1% w/v gels draped well and had good contact with the surface of the tapestry, they deposited too much moisture too quickly in the tapestry yarns, and the surface of the gels was sticky and did not allow them to be removed cleanly. After removal, there appeared to be residue and the remnants of gel left behind on yarns in the tested area. Because the use of suction on the silk areas was out of the question, there was no definitive way to remove the gel remnants.



Fig. 7. Applying gels to cover the entirety of the tapestry. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

It was determined that the best gels were cast at approximately 0.25-in. (6 mm) thickness and had a 3.5% w/v concentration. These gels did not leave remnants on the tapestry, had a slow rate of diffusion, and were heavy enough to maintain good surface contact. Based on initial testing that showed a greater removal of soiling using gels made with a mild detergent solution, the anionic detergent Orvus WA paste was added to the cleaning gels at ratio of 5 mL Orvus to 300 mL deionized water. The gels used for rinsing remained just agarose and deionized water. A large photography tray was used to cast the gels and was cleaned with a mixture of alcohol and deionized water between treatments to inhibit biological growth. Prior to treatment the gels had a pH of 6. Once the gels had set, they were cut from the tray and placed piece by piece over the entire tapestry and were left in place for two hours (fig. 7). Once the gels were removed, they were examined for reuse. The damp tapestry was then covered with cotton drying sheeting, lightly sprayed with deionized water, and patted down. The sheeting was used to prevent further dye migration while drying. The tapestries were allowed to air-dry within the humidity tent after treatment.

Three of the six Baumgarten tapestries were cleaned with the agarose gels before the client decided to discontinue treatments. Each tapestry was covered in its entirety six times with the agarose gels. The tapestries did not receive any spot treatment aside from the microsuction treatment used on the wool areas described in section 2.6.

2.5 REUSING AGAROSE GELS

One of the treatment challenges was the cost of the agarose gels, both in regard to time and money. Molecular biology-grade agarose powder cost a little over \$300 for 500 g at the time of writing. Producing the amount of agarose gels to sufficiently cover a Baumgarten tapestry for one round of treatment took approximately 5 hours, and it took another hour to lay out the gels on the tapestry. Therefore, to keep the cost of treatment reasonable, it was necessary to explore the reusability of the gels.

The “dirty” gels were placed in a plastic bin with 1% Orvus and deionized water solution to be “rinsed.” They were left for 3 days, until the Orvus solution had turned dark yellow. They were then removed and

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

placed on white china silk to test for soiling, as it was hypothesized that the silk would show dirt transfer more clearly than the tapestry. If cleaned gels did not transfer soiling onto the white china silk, it would be safe to assume that they could be reused on the tapestry. Testing determined that three rinses of the dirty gels were enough to prevent soiling transfer back into the silk. After three rinses in the Orvus solution, the pH of the gels also changed and became closer to a neutral pH, despite being highly acidic after use on the tapestry. After about three reuses, the gels began to crumble and were no longer usable. However, the ability to reuse the gels saved considerable time and money.

2.6 AGAROSE GEL TREATMENT EFFECT

The agarose gel treatment made the silk noticeably brighter and removed soiling and staining (fig. 8). For the wool, a more aggressive cleaning strategy was necessary. To remove the accumulated dirt particulates in the wool at both the bottom and top edges of the tapestry, those areas were treated with thicker gels, approximately 0.5-in. (12.7 mm) thick. After the gel treatment, the area was then cleaned again using microsuction. A mild solution of Orvus WA Paste and deionized water was applied with a cotton swab and the moisture was removed using a small pipette attached to a Tiger-Vac on low suction.

In addition to improving the appearance of the tapestries, the gels were able to provide a much greater amount of humidification than the humidity tent. The additional moisture deposited by the gels more effectively preserved the structure of the deteriorating silk fibers than the passive tent humidification. Before the agarose gel treatment, the silk fibers shattered when being prepared for microscopy. In contrast, after treatment, about a third of the fibers maintained their structure and did not shatter (fig. 9). The humidification via the agarose gels also noticeably improved the flexibility of the tapestry.

Prior to the gel treatment, even after well over a year under passive humidification in the humidification tent, the tapestry was stiff and unyielding, but after treatment, it was possible to roll the tapestry easily, which allowed for the suction cleaning of the darkened wool in the center cartouche. The new flexibility also allowed for the application of some stabilizing stitches to close the most egregious tear along the bottom edge on the first tapestry treated. Reweaving or an application of a Velcro hanging system would never be possible for the



Fig. 8. Upper-left corner of panel 1, before (left) and during (right) treatment. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

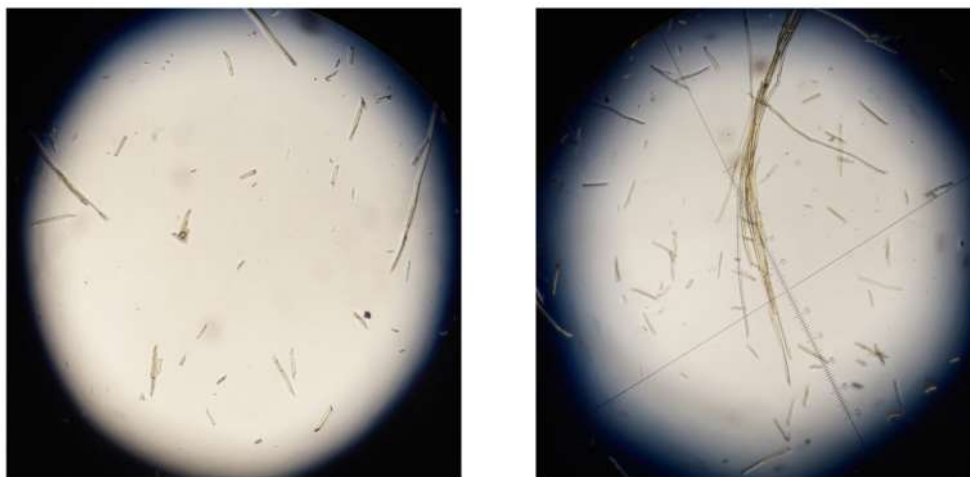


Fig. 9. Silk fibers under microscopy, before (left) and after (right) treatment. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

tapestries. Prior to the client deciding not to continue treatments, a mounting system using magnets with digitally printed backing fabrics was being considered.

3. AGAM TAPESTRY

The other tapestry that needed an agarose gel treatment was designed by the Israeli experimental artist Yaacov Agam and woven in the Goubely Aubusson workshop. The tapestry is dated between 1970 and 1980. Agam is primarily known for his kinetic and optic art and often uses prisms to create a rainbow of colors (Thomason 2016). Like the Baumgarten tapestries, the Agam tapestry also has wefts that made immersive wet-cleaning an impossibility, but for very different reasons. Through fiber microscopy it was determined that the white ground yarns were wool and the various colored yarns were blends of wool and synthetic fibers. The warp fibers were identified as cotton.

3.1 AGAM TAPESTRY CONDITION AND CONSTRUCTION

The tapestry arrived with a lining attached to the back. The front of the tapestry was gray and sooty, while the back of the tapestry, protected by the lining, was clean, and showed the true colors of the yarns. Unfortunately, a hard, yellow glue had been used in the initial application of the tapestry lining, which was subsequently cut off and whip-stitched back on. The glue was initially thought to be hide glue due to its appearance and consistency, but its lack of water solubility and resistance to heat led the conservator to believe that there was a polymer element present; however, the laboratory did not have the resources to test it. The glue was hardened along the top and bottom 5 cm. of the tapestry (fig. 10). The glue appeared to have been applied hastily and unevenly and in several places saturated the tapestry and could be seen from the front (fig. 11). The removal of the glue would become the central challenge of the tapestry's conservation treatment.

3.2 PRELIMINARY TREATMENT TESTING FOR AGAM TAPESTRY

In preliminary treatment testing it was determined that the tapestry could not be wet-cleaned. All of the 21 different colored yarns used in the tapestry were tested for colorfastness. The majority of the colored yarns

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS



Fig. 10. The polymer-hide glue on the back of the tapestry. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

exhibited no dye bleed; however, the red and black yarns were determined not to be colorfast in a mild Orvus solution. Because the border yarn was white it was determined that wet-washing was far too risky because even a small amount of dye bleed would be noticeable on the white wool. Because the tapestry could not be wet-cleaned, a dry-cleaning sponge was used to clean the soiling on the front side of the tapestry.



Fig. 11. The glue so heavily saturated the tapestry that it was visible on the front. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

It was clear that it was necessary to remove the old lining and apply a new one along with a Velcro hanging system. Although the presence of the glue would likely accelerate the deterioration of the tapestry, it was also inconveniently located right where the new lining and Velcro hanging system would be stitched on. As long as the glue remained it would be impossible to pass a needle through the tapestry. Therefore, it was determined that the treatment must involve the removal of as much of the glue as possible.

A variety of solvents and solutions were tested to determine which would be the most effective for removing the glue without damaging the tapestry. Industrial methylated spirit, acetone, and Orvus solutions initially proved to be the most effective in softening and dissolving the glue. However, the amount of time required to remove the glue was too long, so further solvents—including ethanol, mineral spirits, and amyl acetate—were tested.

Amyl acetate removed the most glue. The next step was testing the amyl acetate on a small area of the tapestry using a capillary action removal method with blotter paper and cotton lintens. For this method, the blotter paper was cut in the shape of the embedded glue stain and one side gently tufted. It was then placed on top of the stain and cotton lintens placed on top. Amyl acetate was then applied, using a dropper, to the cotton lintens and then the cotton lintens were covered with a small piece of aluminum foil. After 20 minutes, the blotter and lintens were removed and the softened glue gently rubbed with a cotton swab to test how well the method softened the glue. The cotton swab showed significant amounts of glue being removed.

3.3 TESTING AGAROSE GEL AS VEHICLE FOR SOLVENT DELIVERY

Agarose gel was then tested as a vehicle to deliver the amyl acetate. The advantages to using a rigid gel to apply solvent are that, given the uneven surface of the tapestry and the glue, the gel can have greater surface area contact with the tapestry due to its drapability, and it can be left for long periods of time. It was hypothesized that the agarose gel would also allow for a slower diffusion of the amyl acetate via capillary action, which would minimize the possibility of tidelines. It was thought that the use of agarose gel would be more practical and efficient, since the rigid gels could be left in contact with the tapestry for several hours, allowing the conservator to work on other aspects of the project.

To test the agarose gel with amyl acetate, a 10% w/v agarose gel with 20 mL amyl acetate and 1 mL 1% w/v Orvus solution in 100 mL total solution was placed onto the glue near the lower-left corner of the tapestry. Gauze was placed under the tapestry, and Mylar and glass weights were placed on top of the rigid gels. The gels were left in place for 4 hours, during which time the tapestry was checked every 30 minutes for signs of tidelines or diffusion to the front side. Although there was no visible change in the gel or evidence of particulates within the gel, the area where the amyl acetate gel had been lightened and softened considerably, suggesting the removal of glue (fig. 12).



Fig. 12. Testing gels as amyl acetate carrier. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

3.4 ADAPTING AGAROSE GEL TREATMENT

It became necessary to expedite the agarose gel treatment method. A new protocol was developed to speed up the treatment. Through testing it was determined that the best alternative method was to apply amyl acetate directly to the glue, drape 2% w/v agarose gels over top, and then cover the gels with Mylar and glass weights.

Comparatively, the direct application of the amyl acetate to the tapestry worked much faster. Due to the increased amount of amyl acetate the gels were left on only for 1 hour and then were removed. Any glue that had softened but not yet dissolved was then swabbed to remove it. The process was repeated until the glue removal was complete.

A mild Orvus solution was then applied and removed using a modified suction platen to wash away any remaining glue (fig. 13). The suction platen did not have sufficient suction force to be used on a textile with the thickness of the tapestry, so the surface area of the suction platen was reduced by taping clean plastic sheeting over the half of the suction surface. The affected area was then rinsed multiple times with deionized water to remove any remaining amyl acetate.

Due to the amount of time the glue had been embedded in the tapestry, staining, discoloration, and glue oxidation were still visible on the back and front of the white wool (fig. 14). However, the appearance of the staining was significantly minimized.

The glue removal allowed the application of a lining and a Velcro hanging system in the conservation laboratory to better preserve the tapestry prior to installation in the client's home (fig. 15).



Fig. 13. Rinsing with modified suction platen. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.



Fig. 14. Evolution of staining visible on the back of the tapestry during treatment. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.



Fig.15. Tapestry, after treatment, with applied Velcro hanging system. Courtesy of the Textile Conservation Laboratory at Cathedral Church of St. John the Divine.

4. CONCLUSIONS

For both tapestries, agarose gel provided a way to eliminate damaging soiling that otherwise would not have been easily removable. However, the use of agarose gel in tapestry conservation and cleaning is far from perfect. There were significant challenges regarding the cost, application, and time investments of the two treatments.

The initial research and testing for both treatments were undertaken while the conservator was an intern and graduate student, which only mediated part of the cost. However, the success of both treatments indicates a potential for large-scale gel application and agarose gel use in tapestry conservation. Although both treatments focused on soiling removal and cleaning, the author believes there are many creative uses for agarose gels in textile conservation, particularly for materials that cannot undergo wet-cleaning.

AGAROSE TWO WAYS: SUCCESSES AND CHALLENGES IN LARGE-SCALE GEL APPLICATIONS

ACKNOWLEDGMENTS

I thank my mentors and colleagues at the conservation laboratory at St. John the Divine: Marlene, Valerie, Ainia, Jamie, Bari, Ligia, and Krystyna. I would also like to thank my conservation professors at the Fashion Institute of Technology: Laura Mina, who taught a class on agarose gels, Bernice Morris, Sara Reiter, Denyse Montegut, and Valerie Soll. I thank the George Stout Memorial Fund for making the presentation of this paper possible.

REFERENCES

- Hunter, G. L. 1915. American tapestries. *Art and Progress* 6 (12): 439–446. <http://www.jstor.org/stable/20561548>.
- Mina, L. 2015. Personal communication. Fashion and Textiles: History, Theory, Museum Practice, Fashion Institute of Technology, State University of New York.
- Sahmel, K., L. Mina, K. Sutherland, and N. Shibayama. 2012. Removing dye bleed from a sampler: new methods for an old problem. *Textile Specialty Group Postprints 22. AIC 40th Annual Meeting. Albuquerque, NM*. Washington, DC: AIC. 78–90.
- Thomason, S. 2016. UAB's *Yaacov Agam: Metamorphic* exhibit features more than 30 works by art pioneer. Alabama Newscenter. <http://alabamane.wscenter.com/2016/05/30/uab-presents-yaacov-agam-metamorphic/>
- Warda, J., I. Brückle, A. Bezúr, and D. Kushel. 2007. Analysis of agarose, carbopol, and laponite gel poultices in paper conservation. *Journal of the American Institute for Conservation* 46 (3): 263–279.
- Zrebic, A. M. 1980. The American tapestry manufactures: Origins and development, 1893 to 1933. Ph.D. diss., New York University.

FURTHER READING

- Scott, C. L. 2012. The use of agar as a solvent gel in objects conservation. *Objects Specialty Group Postprints 19. AIC 40th Annual Meeting. Albuquerque, NM*. Washington, DC: AIC. 71–83.
- Tímár-Balázs, Á., and D. Eastop. 1998. *Chemical principles of textile conservation*. New York: Butterworth-Heinemann.

SOURCES OF MATERIALS

Orvus WA Paste

Talas

330 Morgan Ave.

Brooklyn, NY 1121

Tel: (212) 219-0770

www.talasonline.com

DANA GOODIN

Agarose LE, molecular biology grade
Benchmark Scientific, Inc.
PO Box 709
Edison, NJ 08818
Tel: (908) 769-5555
www.benchmarkscientific.com

Amyl acetate, 99%
Sigma-Aldrich
3050 Spruce St.
St. Louis, MO 63103
Tel: (800) 325-3010
www.sigmaaldrich.com

Suction platen
RH Conservation Engineering
PO Box 1199
Morongo Valley, CA 92256
Tel: (+61) 0419 892919
www.rhconservationeng.com

AUTHOR BIOGRAPHY

DANA GOODIN is currently pursuing her PhD in Apparel, Merchandising, and Design with a focus in fashion history and conservation at Iowa State University. She received an MA in Fashion and Textile Studies: History, Theory, Museum Practice from the Fashion Institute of Technology with a focus in textile conservation. From 2015 to 2017 she worked as a textile conservation assistant at the Textile Conservation Laboratory at the Cathedral Church of St. John the Divine. E-mail: drgoodin@iastate.edu.