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DISCUSSION GROUP CO-CHAIRS

Art on Paper Discussion Group 2024
Tape and Adhesives: New Techniques and Materials for an Age-Old Problem

INTRODUCTION

Tape and oxidized adhesives have long created challenges for paper conservators because of the damage they cause through staining, distortion, and the deposition of adhesive residue; in extreme cases, oxidized adhesive residues have led to the breaking apart and fragmentation of papers. Traditionally, the removal of tape carriers and adhesive has involved localized heat, erasers, and the application of organic solvents. As the field of conservation tries to move away from using toxic chemicals, other methods have been employed with varying degrees of success. This year's panel wanted to highlight practical treatment options that were innovative and less hazardous to the practitioner and the object being treated. The moderators added a discussion prompt for the attendees' consideration, asking whether heat and chemicals are actually superior treatment strategies over mechanical removal. The panelists presented two different and practical presentations, which were followed by an engaging 45-minute discussion with the audience. The first speaker, Rebecca Pollak, associate paper conservator, presented a talk co-authored by Adam Novak and Teresa Duncan, PhD, entitled "Fundamental Experiments and Applications of a Non-Aqueous Gel for Adhesive Removal on Paper." Pollak discussed the solvent gel Sylgard 184 polydimethylsiloxane (PDMS) and how it can be used to facilitate the controlled release of solvent and/or solvent vapors. Heather Hendry, senior paper conservator, offered insight into a tape and residual adhesive reduction protocol that emphasized mechanical removal options (spatulas, heat, and electric erasers), followed by limited use of solvents and non-gel poultices. During the discussion, Adam Novak joined the other speakers on stage to answer questions.

Summaries of discussion groups at the Book and Paper Group Session, AIC's 52nd Annual Meeting, May 20–24, 2024, Salt Lake City, Utah

PRESENTATION SUMMARIES

REBECCA POLLAK
ASSOCIATE PAPER CONSERVATOR, THAW CONSERVATION CENTER, MORGAN LIBRARY AND MUSEUM

Rebecca Pollak presented "Fundamental Experiments and Applications of a Non-Aqueous Gel for Adhesive Removal on Paper," a treatment using Sylgard 184, a rigid PDMS elastomer, to aid in the removal of an adhesive from an artwork on paper. Her research was undertaken with Adam Novak, paper conservator and owner of Novak Studios, and Teresa Duncan, PhD, a conservation scientist with the National Gallery of Art.

Sylgard 184 is a silicone elastomer commonly used for encapsulating electronics. It forms a continuous film that can easily be applied and removed from an object's surface, and its rigid structure does not penetrate paper fibers. Sylgard swells in a range of low-polarity solvents, making it a useful counterpart to other "rigid" hydrogels used in conservation that are optimally used with more polar solvent systems. It is sold as a two-part kit and is easily prepared by combining the elastomer base with a curing agent. Once mixed, the gel cures at room temperature over several days or more quickly at higher temperatures. The gel must be rinsed after curing to ensure that uncross-linked PDMS is removed. Pollak and the other researchers prefer rinsing in a mixture of 1:1 heptane and acetone to reduce swelling of the gel and accelerate evaporation of solvent after the final rinse. Sylgard 184 can be modified to obtain different characteristics. The manufacturer recommends mixing the elastomer base and curing agent at a ratio of 10:1; however, increasing the elastomer base to a ratio of 20:1 yields a softer, more flexible film. Thin gels conform very well to surfaces, yet they are not able to retain the solvent long enough to prevent the deformation of the gel. Gels at a thickness of 1.5 mm conform well and can be used longer with reduced deformation. Sylgard can hold a greater quantity of low-polarity solvent than higher-polarity solvent, and the gel increases in size accordingly.

The treatment object presented by Pollak was an approximately 60 × 40 inch, double-sided charcoal drawing on tracing paper made in the mid-20th century. The primary support was adhered to a paper-laminated canvas and stretched over a wooden strainer. The front of the tracing paper bore an uneven coating of spray fixative, whereas white paint had been brush applied to the back. In 2010, the object was rehoused in a sealed frame package and stored in a non-museum environment, and photographic documentation from this time indicates that the tracing paper had darkened severely since then. With the expectation that future storage environments would be unregulated, the researchers decided that removal of the drawing from the mount materials was the best solution.

The adhesive and white paint were analyzed using FTIR. Analysis indicated that the adhesive was a neoprene-based material belonging to a family of synthetic rubbers. Data showed that the paint was titanium white acrylic containing a significant amount of chalk filler. Separation of the white paint layer from the paper support was possible, although not without disturbing the charcoal media on the verso. Therefore, the goal was to remove the neoprene adhesive from the white paint layer.

Novak and Pollak determined that the ideal solvent mixture was a 2:1 ratio of acetone to ethyl acetate. However, their tested delivery methods—dampened cotton, xanthan gum, and Carbopol gels—did not provide enough dwell time and caused the adhesive to soften briefly, only to rapidly harden again. To address this problem, they turned to Sylgard 184. To tailor Sylgard to the polar solvent mixture, they prepared thicker sheets of the gel, about 1/8 to 3/8 inches. The thicker sheets hold more solvent and increase the dwell time. The gels were prepared in 5 × 7 inch Plexiglas trays and cured for approximately a week at room temperature. Rinsing followed. To remove the adhesive from the paint layer, the gels were applied, covered in Mylar and Plexiglas, and weighted for 30 minutes. This method allowed the adhesive to be effectively softened and peeled, although within a narrow window of time before rehardening. The gels were reused by soaking again in the solvent mixture.

Pollak concluded by offering some tips about Sylgard 184 and its use. The gels can be rinsed of adhesive residue, dried, and stored indefinitely. She has used two-year-old gels with success. Sylgard is available for purchase online from the manufacturer or from Amazon.

Although pricey, the efficiency of the product and the time saved during treatment made up for their cost in this case study. Pollak noted that further study has been undertaken to alter morphologies of PDMS gels to improve contact and exchange with object surfaces by preparing them with removable materials or on different surfaces. Currently, these gels do not perform better than the slab form. Future work may better characterize these pores and expand the gel's utility in conservation.

HEATHER HENDRY
SENIOR PAPER CONSERVATOR, CONSERVATION CENTER FOR ART AND HISTORIC ARTIFACTS

Heather Hendry presented "A Utilitarian Approach to Tape Removal." Hendry explained how tapes have historically been addressed by undergoing extensive solvent testing to discover the best protocol to reduce carriers and oxidized adhesives. For some conservation laboratories, this approach is not always possible or practical. Further, she questioned whether solvent use is actually necessary for most tapes and added that their use can push adhesive further into paper fibers. She followed by sharing a flowchart she developed to aid in decision making when treating pressure-sensitive tape. Hendry emphasizes the chart's simplicity: there is no mention of solvent testing or tape identification. The chart differentiates between tape adhesive that is hardened or tacky (figs. 1, 2).

If the tape is tacky, applying heat via a hot air pencil or heated spatula can aid in lifting the carrier. The adhesive can then be removed mechanically using an eraser such as crepe or vinyl. For durable papers, Hendry especially likes an electric eraser, which can be found online from stationery suppliers as battery-powered or USB-chargeable devices. The electric eraser provides speed, control, and single-direction rotation, making treatment around edges and tears easier. For tape that is hardened, Hendry suggests reducing the adhesive mechanically with micro-spatulas or scalpels. If the adhesive needs to be further reduced, Hendry then uses solvents. A consideration here is the color of the adhesive. If the adhesive is yellow or orange, acetone will likely be effective. Otherwise, a blend of 40% ethyl acetate, 40% acetone, and 20% ethanol may work. If the adhesive is clear or oily looking, she suggests trying ethyl acetate first and continuing with toluene, if necessary.

When Hendry does use solvents to reduce adhesives, it is on a suction platen with the adhesive side down. When incorporating solvents, care should be taken to choose a method that will not drive the adhesive further into the paper, as it will later oxidize and create tide lines as it ages. She emphasizes that minimizing health risks to the conservator should be a goal, and if solvents are used, the least harmful ones should be prioritized where possible.

DISCUSSION SUMMARY

The session concluded with a discussion between the presenters, moderators, and audience members. Questions and comments about the presentations were directed at Hendry, Novak, and Pollak, and a conversation about the discussion prompt followed.

The questions for Pollak and Novak centered on Sylgard 184's effectiveness when soaked in different solvents and its ability to hold them. Pollak explained that high-polarity solvents such as acetone and ethyl acetate do not swell the gel as

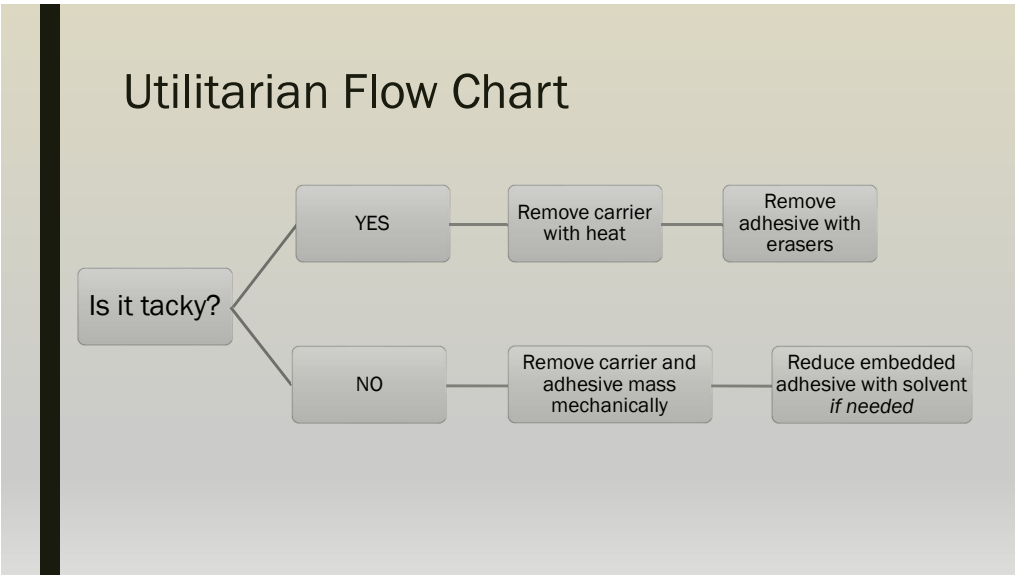

Fig 1. Tape removal decision tree. Courtesy of Heather Hendry.

much as low-polarity solvents. This can be viewed as a limitation or a benefit depending on the desired application of the gel. In the treatment presented, the Sylgard held the low-polarity solvents long enough to soften the adhesive so it could be safely removed. She added that because Sylgard is silicone, it will not absorb water; therefore, hydrogels may be more successful if aqueous blends are used. Pollak and Novak remarked how Sylgard's ability to retain solvents is advantageous in several ways. The gel does not release liquid after initial blotting, and tide lines were not observed during treatment. Additionally, the slow evaporation rate of the solvent reduced the conservators' exposure to fumes. An audience member noted that toluene has a slow evaporation rate and questioned if Sylgard could extend this rate further. While Pollak has not tried toluene with Sylgard, Novak observed that the Sylgard indeed extended the working time of the polar solvents used in the treatment, which would have otherwise evaporated quickly before the adhesive could be softened. The longer dwell times that are possible with Sylgard may indicate that lower-toxicity solvents could be used in place of toluene with success. When asked about storage, Pollak noted that it is important to keep dust from embedding in the gels. Dry storage of the gels between pieces of Mylar inside plastic bags achieves this. Sylgard can be reused with different solvents, and thorough rinsing of the

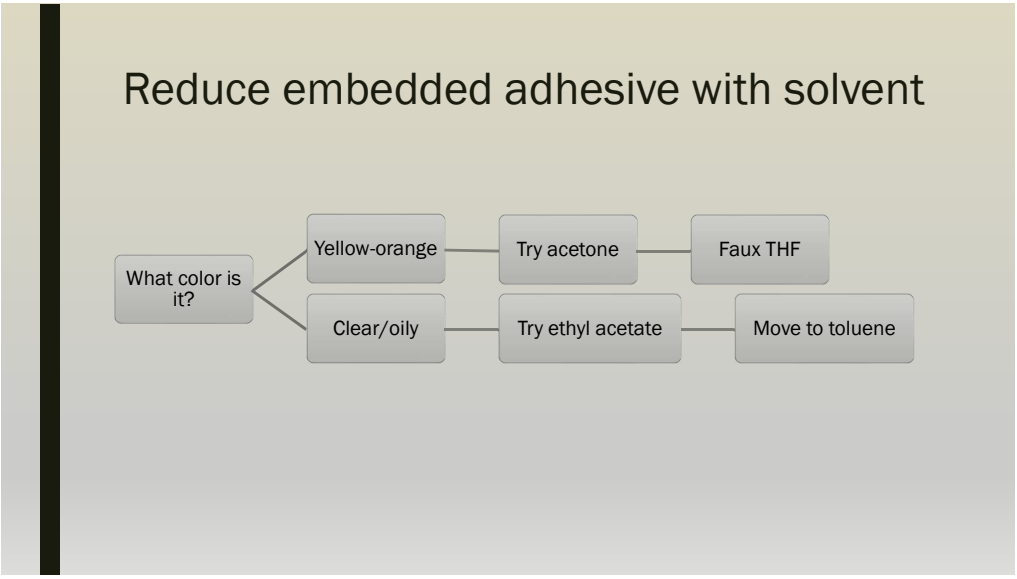

Fig 2. Solvent choice decision tree. Courtesy of Heather Hendry.

gels after casting seems to clean them of potential residues. Pollak and Novak note that more research is needed regarding the use of Sylgard directly on media, although it seems to function better as a solvent reserve than a stain reducer. When asked about the discovery of Sylgard 184, Pollak said that collaboration between herself and Duncan on several varnish and overpaint removal projects led to experimentation with the gel as a tool for adhesive removal from paper. Their protocol was developed from the manufacturer's instructions and further tailored for use in art conservation.

The questions for Hendry were mainly focused on the electric eraser. It was emphasized that soft papers are not good candidates for an electrical eraser. When a paper is too soft for the electric eraser, Hendry suggested using cellulose powder and ethanol or isopropanol. Someone asked if the electrical eraser had variable speeds. Apparently, the battery-operated models slow down as they lose their charge, but electrical erasers that plug in have only one speed.

A member of the audience mentioned the importance of considering whether the tape is original to the piece when making decisions about removal (note 1).

About halfway through the discussion period, the moderators introduced a discussion prompt: "Are heat and/or chemicals actually better for the object? Or is some fiber loss from mechanical removal acceptable to avoid subjecting paper objects to heat and chemicals?" Several people shared instances when they felt mechanical means of removal which resulted in minimal fiber loss to the object was acceptable, and they considered it less damaging to the piece in the long run than the introduction of solvents. Some such examples included removing white linen tape mechanically instead of using moisture to avoid the transfer of optical brighteners from the tape to the artifact. Another person mentioned the mechanical removal of dried PVA using a scalpel since the dried adhesive is not fully soluble in solvent, a technique that typically results in some fiber loss. Another example of accepted fiber loss was when removing tape from a tear.

An audience member shared that when working with tacky tapes, she found that using heat from a reptile heating pad added overall low-level heat and softened the adhesive enough to allow for mechanical removal. Another method of isolating tacky tape was the introduction of cellulose powder and vinyl erasers. The cellulose powder is rubbed into the tacky tape with a finger, causing it to bulk up, then a vinyl eraser is used to mechanically remove the tacky adhesive. They went on to say that they sometimes dusted cellulose powder on sticky adhesive residue and left it in place, thus reducing the chance for the tape to impact adjoining objects it came into contact with.

Finally, solvent and suction using different suction disks were discussed. The disks recommended included a fritted glass disk (which can crack under too much vacuum pressure), silicon flange, and fritted metal. Finally, an article in the *Book and Paper Group Annual* that gave instructions on how to make a fritted glass suction disk was mentioned (Varga 2007).

ACKNOWLEDGMENTS

The Art on Paper Discussion Group co-chairs wish to thank the presenters and researchers for generously sharing their work at this session. We also thank the attendees for adding depth through their questions, comments, and enthusiastic engagement. Finally, many thanks to our colleagues, BPG Chair Liz Dube, Program Chair Amy Hughes, and Assistant Program Chair Morgan Adams, for all of their support in helping organize the session.

NOTE

1. A 2020 article by Knauf and Utter discusses various ways to address the issue of tape when it is part of the final object. (Please forgive the shameless plug, it seemed relevant to the topic.)

REFERENCES

Knauf, Diane E., and Jodie Utter. 2020. "The Gentling Collection: Establishing a Treatment Protocol for Multilayered Works on Transparent Paper." *Book and Paper Group Annual* 39: 50–60.

Varga, Lauren M. 2007. "A Hand-Held Surface Suction Device: Design, Construction, and Application." *Book and Paper Group Annual* 26: 171–76.

SOURCES OF MATERIALS

Dowsil Sylgard 184 Silicone Elastomer Kit 0.5KG (1.1LB) clear
Krayden Inc.
1491 W. 124th Ave.
Denver, CO 80234
800-44-80406
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