The Use of Gore-Tex to Transmit Solvent Vapors in the Treatment of Drawings by Henry Ossawa Tanner

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INTRODUCTION

A group of drawings[1] by Henry Ossawa Tanner was treated in 1989 at the Conservation Center for Art and Historic Artifacts in Philadelphia in preparation for a retrospective exhibition that opened at the Philadelphia Museum of Art and travelled to several museums across the country. The drawings were adhered to acidic cardboard with a darkened adhesive that was soluble in organic solvents. This paper focuses on one aspect of the treatments, the use of Gore-tex to deliver solvent vapor to swell and soften the adhesive. The treatment of a series of drawings with the same adhesive and mount problems was instructive in that it allowed modification and refinement of the technique with each successive drawing.

THE ARTIST

Henry Ossawa Tanner lived from 1859 to 1937, and spent most of his formative years in Philadelphia. He was a prominent African-American artist, although his work fell into some obscurity after his death. Tanner's formal study of painting began at the Pennsylvania Academy of Fine Arts in 1879, where he studied with Thomas Eakins among others. In 1891 Tanner left Philadelphia to study in Paris. He lived in France for the rest of his life, although he travelled extensively, and often returned to the United States.

In his paintings Tanner explored a broad range of traditional styles, but with a fairly individualistic approach. Many of his early landscapes reflect the influence of Eakins. He soon turned to genre painting, often portraying African-American subjects. In his later years Tanner is recognized for his visionary religious paintings. Tanner did not exhibit his drawings and relatively few of them survive, but those that do include some powerful and elegantly executed studies.

CONDITION

The drawings that were treated for this exhibition were done primarily in charcoal and fabricated black chalk. The design material exhibited virtually no friability, presumably because it had been compressed during mounting. There did not appear to be any fixative: there was no distinctive fluorescence with ultraviolet light; no surface sheen in raking light; nor any discoloration that might indicate the presence of an aged fixative.

The drawings were on good quality, medium-weight wove and laid papers. The paper surfaces were compacted, and appeared to be hard-sized. The drawings were mounted to 1/4" thick gray cardboard with a resinous material that had darkened to a disfiguring golden brown, and in some instances had penetrated the paper causing considerable staining. The back of the cardboard mounts often bore multiple labels and inscriptions, which could be split away intact and saved. This type of mount is common on Tanner's drawings, but its origin is not known.

Limited testing was done on the mount materials. A phloroglucinol test on fibers from one board gave a strong positive reaction for groundwood. Fourier Transform Infrared Microspectroscopy indicated that the material used to adhere the drawings is a plant resin. The goal was to remove as much of it as possible because it was disfiguring and appeared to cause embrittlement of the paper.

TREATMENT

Desiccation of the adhesive had caused limited detachment between the paper and board on some of the drawings, and in a few areas a flexible spatula could be inserted to separate them further. The extreme density of the cardboard, however, made its complete removal very difficult. With the smaller drawings, the boards could be reduced by splitting them through the middle, but because it required considerable strength and control to do this, it was not safely possible with the larger drawings where the boards offered greater resistance. To pare away an entire board would have been extraordinarily time-consuming, because the scalpel blade became dull almost immediately.

The first drawing treated was *Half-Length Study of a Bearded Man with Long Hair* (c.11" x 9") done in the early 1890s in Paris. The board was removed from the drawing by splitting it through the middle with a flat metal spatula, then paring away the residues with a scalpel. When the board was removed the adhesive was seen to be unevenly and randomly applied, and extremely thick in some areas. Broad portions of the paper were not adhered and exhibited no adhesive staining.

Of the many solvents tested, only acetone softened the

adhesive effectively. To minimize overall exposure of the paper to the adhesive, a solvent bath was not used for initial adhesive removal. Several approaches to local removal were tested: inverted solvent chambers did not soften the adhesive sufficiently, even with prolonged exposure; direct application of solvent drove it into the paper; and it was not possible to remove an appreciable amount of adhesive mechanically. The use of Gore-tex to transmit solvent vapors was found to be the most effective approach. It allowed the acetone to soften the adhesive without solubilizing it, thus preventing penetration and further staining of the paper.

Gore-tex is the patented trade name for expanded polytetrafluoroethylene, or PTFE. It is the same chemical as teflon, stretched at a high temperature to form a porous, air permeable material. Because of the small pore size, 0.1 micron, water and many organic solvents penetrate Gore-tex as a vapor but not as a liquid. Gore-tex is non-polar and chemically inert, with no known solvating agent. The source of its stability is the strong carbon-fluorine bond in the molecule which contributes to its excellent long-term aging characteristics.

The Gore-tex that is commonly used in paper conservation for controlled application of moisture, and the form used here, is a laminate of a thin Gore-tex membrane, bonded with heat to a non-woven polyester felt. The polyester felt is stable in a wide range of chemical agents. Spot tests confirmed that acetone did not affect the Gore-tex or the polyester felt, so treatment proceeded.

The drawing was placed in the fumehood, face down on glass that was covered with glassine. This was intended to limit evaporation through the front of the drawing and help protect the media. A strip of Gore-tex was placed on the back of the drawing with the membrane side in contact with the adhesive. A slightly smaller acetone-saturated blotter was placed over the Gore-tex, and a glass rectangle over the blotter to provide light weight and to minimize evaporation of the solvent.

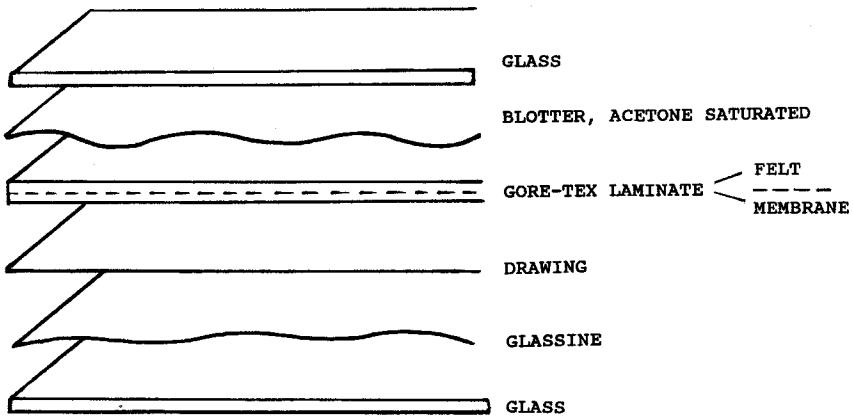
After five to ten minutes the Gore-tex and overlying materials were shifted aside, a small area at a time, to expose the softened adhesive. The adhesive had become gelatinous and could be scraped away with a honed microspatula. The technique worked best if residual cardboard was reduced as much as possible before introducing the solvent vapors. Adhesive spots on the recto were softened for removal by applying the layered Gore-tex package to the front of the drawing.

With *Half-Length Study of a Bearded Man with Long Hair*, most of the adhesive was removed from the drawing using the Gore-tex, although some pebbly bits remained embedded in the paper. Adhesive was reduced further by placing the drawing face up on an acetone-saturated blotter in a covered metal tray for about fifteen minutes. It was then transferred to the suction table, and misted with acetone while light suction was applied. Relatively little additional material was removed in each of these steps. When treatment was complete, visual inspection suggested that almost all the adhesive had been removed from the drawing paper, although substantial staining remained visible on the reverse.

This treatment technique, using the layered Gore-tex package with solvents, was developed further on a second drawing, *Study for American Red Cross Canteen* done in 1918. It was one of the largest drawings treated (c. 18 1/2 x 20 1/2"), and the most obviously deteriorated. The drawing was adhered firmly to the board overall. Where adhesive was applied to the front and back of the drawing margin the paper was fractured and brittle, especially in the areas of heaviest application.

Removal of the board with a scalpel would have taken a prohibitive amount of time. Attempts to split away the rigid board with the drawing face up were unsuccessful. Acetone applied directly to the margins to release them was difficult to control.

Treatment of the previous drawing suggested an alternate approach: using Gore-tex to deliver solvent vapors from the front of the drawing to soften the adhesive on the back. To limit the amount of adhesive transferred from the front drawing margin onto the Gore-tex, a strip of Japanese tissue was inserted between the Gore-tex and the drawing. After an appropriate interval, the layers were removed and much of the



CROSS SECTION OF LAYERS

Figure 1 illustrates the layers in the Gore-tex package.

softened adhesive on the front margin was lifted away on the tissue.

With this drawing the Gore-tex package was left in place slightly longer than in the previous treatment so that the acetone vapor could penetrate the adhesive on the front margin and the drawing paper, and soften the adhesive below. The drawing paper was then separated from the top surface of the thick mounting adhesive by inserting a thin bamboo spatula. Most of the adhesive was left behind on the board. Polyester web was placed beneath the separated paper to prevent reattachment as treatment progressed. In small stubborn areas the paper was released by direct application of acetone or by cutting into the backboard.

After as much adhesive as possible was removed locally, the drawing was placed face up in an acetone bath, and the solvent changed several times. Adhesive remaining on the front margin was reduced with cotton in the bath. The drawing was then placed face down in a clean solvent bath, and adhesive swabbed gently from the verso. No movement or softening of the media was noted at any time. The appearance of the drawing was much improved after treatment; adhesive staining and discoloration in the paper were reduced considerably.

The last drawing discussed here is *Study for the Head of the Kneeling Disciple* done c.1924 (c.15 1/2 x 15"). After talking with colleagues, a more traditional approach, using a large enclosed vapor chamber, was tried as a potentially simpler and more effective way to soften the adhesive. The drawing was placed on an open grid over acetone in an enclosed tray. After four hours an attempt was made to insert a bamboo spatula between the drawing and the board. It was unsuccessful since the adhesive had become only slightly tacky, and it seemed unlikely that longer exposure would be significantly more effective. After treatment, while cleaning the Gore-tex rectangles with acetone, it was discovered that the felted component of the laminate was able to hold a great amount of solvent. This capacity for retaining solvent may be the reason for the success of the Gore-tex technique.

To encourage separation of the drawing from the mount, while the drawing remained in the enclosed vapor chamber, a Gore-tex package was applied briefly to the recto. Although this softened the adhesive enough to allow separation of the drawing from the board, it caused adhesive staining to come through to the front of the drawing. Since this was not acceptable, the drawing was removed from the chamber and the solvent allowed to evaporate.

The following day the Gore-tex package was applied again to the front of the drawing (not in a vapor chamber), but adhesive continued to move forward in the paper. It appeared that the adhesive had become more soluble in acetone, or that it was somehow different from the adhesive in the previously treated drawings. The remaining cardboard was removed mechanically, followed by adhesive removal using a Gore-tex package applied to the drawing verso. Finally, the drawing was placed face up in an acetone bath, with several changes of solvent, removing the adhesive that had penetrated to the front.

SUMMARY

By using a polyester felt Gore-tex laminate to treat this group of drawings, the solvent soluble mounting adhesive was softened sufficiently to ease its bond with the drawing papers. In one treatment a layered Gore-tex package, consisting of a small rectangle of felted Gore-tex, an acetone saturated blotter, and a glass weight, was placed on the back of a drawing over residual adhesive. Exposure to the solvent vapors through the Gore-tex produced a gelatinous adhesive layer that could be scraped away. Residual embedded adhesive was removed in a solvent bath, or with crepe squares after softening it with small inverted solvent chambers.

Where Japanese tissue was placed between the Gore-tex laminate and the adhesive, much of the adhesive attached to the tissue and could be lifted away. Where manipulation of the dense board threatened the safety of a brittle drawing, the layered Gore-tex package was applied to the front of the drawing. This softened the adhesive and allowed a spatula to be inserted between the drawing and the board to separate them. The Gore-tex also appeared to deliver the solvent vapor in a more efficient and concentrated manner than did a solvent chamber. Based on its utility in these solvent treatments, it seems certain that the use of Gore-tex with organic solvents will have wider application in conservation treatments in the future.

NOTES

[1] The drawings treated were all from private collections. The three drawings discussed in this paper are *Half-Length Study of a Bearded Man with Long Hair, Study for American Red Cross Canteen*, and *Study for the Head of the Kneeling Disciple*. They are reproduced in the exhibition catalogue by Mosby, Dewey F. and Darrel Sewell, *Henry Ossawa Tanner*, Philadelphia, 1991.

[2] In a computer spectral search, run using the Gettens Raw Materials FT-IR Library and other commercially available libraries, copal standards produced the closest spectral matches for this material, with other unidentified components also present.

[3] Purinton, Nancy and Susan Filter. "Gore-tex: An Introduction to the Material and Treatments," in *The*

Book and Paper Group Annual, 11, 1992. Information on Gore-tex presented here is derived from Purinton and Filter's article and from the product literature.

[4] In a later refinement, with another drawing, embedded adhesive was softened using small inverted solvent chambers, and then removed with a crepe square. The solvent chambers consisted of Plaster of Paris cast in place in small glass jars, and saturated with the chosen solvent. This technique comes from an unknown source.

[5] It is interesting to note the effect of aqueous treatment on this drawing. Discoloration in the upper third of the paper was substantial, and testing indicated that the discoloration would move readily with water. After adhesive removal was completed, the drawing was washed on a stack of wet blotters; the blotters were changed several times, as considerable discoloration moved into them from the paper. After blotter washing, the drawing was partially air-dried before flattening. When the media was tested with a swab after this treatment step, a small amount of transfer occurred. It appeared that the chalk, which had been compressed during the mounting process, was returned to a more friable state due to the swelling of the paper fibers during washing.

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