Surface Treatment of a Philadelphia Pillar-and-Claw Snap-Top Table

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I. Background

The subject of this paper is a pillar and claw tilt-top tea table ca. 1765 with a Philadelphia, Pennsylvania provenance. The table was purchased by Henry Francis du Pont prior to 1950, being on display in the Blackwell Parlor of the Winterthur Museum since that time. This table represents the best of Philadelphia Chippendale or Rococo furniture from the period. An apparent mate to this table, presently in a private collection, was published in William Horner's 1935 Blue Book, Philadelphia Furniture. The 1977 reprint of this book has a photograph of this possible mate on the cover.[1] Winterthur's table is similar to the much publicized tilt-top table that was auctioned at Christies on January 26, 1986.[2] Eight pairs of volutes in the "pie crust" or "scalloped" decoration and the lack of a lip on the base to the pedestal distinguish the Winterthur table. The turned pedestal is decorated with a fluted column, flattened ball and stylized floral carving. The three legs have acanthus leaf carved knees and ball and claw feet. The wood in the table is mahogany (sweitenia sp.).[3] Additional materials include a brass catch arrangement, steel screws and an iron brace under the pedestal. Original or early casters are now missing.[4] The measurements are: height 28 1/8" (71.4 cm), Diameter 34 3/8" (87.3 cm).

II. The Surface Concerns of the Table

Color slides ca. 1960 indicate that before 1974, this table had a dark, "alligatored" finish on the base and a complete, although worn, coating on top. A 1974 treatment report states that because of water damage, the old finish on the top was removed. It is not known what solvent was used to take off the existing surface coating but is assumed to have been alcohol.[5] The 1974 report records that six coats of "Zar" polyurethane were then applied to the top.

The old finish on the base was removed in June of 1981 for purposes of a study being carried out on the carving.[6] A thin coating of "lemon shellac", was applied followed by wax, according to the treatment report.[7]

Since the completion of the finish work stated above, numerous concerns were raised about the table's appearance. The sentiment was strong enough from various parts of the Winterthur community that a suggestion was made to take the table off of display until the visual qualities of the piece were substantially improved. The table was examined in January of 1986 with the following concerns being noted.

The polyurethane on the top was hazy having a plastic-like appearance. It looked like the 1974 finish also had a toned layer streaked on under the polyurethane. The grey or turbid quality of this surface coating seemed to be more pronounced then it was in a 1974 photograph.

The base, visually differing from the top, had a "starved" look to it having a minimal amount of a surface coating. The 1981 cleaning had rendered the wood quite porous and lacking of contrast in the contours of the carved surface.

The issue about a polyurethane becoming increasingly difficult to remove as it ages needed to be addressed. While it may have the propensity to continue to cross link and become even more irretractable, the possibility was not considered a major concern for this particular treatment. The polyurethane is unquestionably a stubborn finish as it is designed to be as resistant as possible to abrasion, water and other solvents.

In summary, it was the inappropriate visual representation of the top, the scant finish on the base, the incompatibility of the two and the knowledge that the polyurethane will certainly not be any easier to remove in the future hat made it necessary to proceed with treating the surface coating on the table. The team that studied the piece for its condition concerns included Mark Anderson, Associate Furniture Conservator; Gregory Landrey, Furniture Conservator; Michael Podmaniczky, Associate Furniture Conservator; Nancy Reinhold, Furniture Conservation Technician; Richard Wolbers, Associate Paintings Conservator; and Philip Zimmerman, Senior Curator. This same group remained involved throughout the treatment of the piece. Landrey, Reinhold and Wolbers carried out the work described later.

III. The Proposal

With the need for treatment established, a proposal was then drawn up. The four step project was designed to be a combined effort of Winterthur's Paintings Conservator, Senior Curator and Furniture Conservation Staff. The primary points of the proposal were surface characterization, designing a polyurethane remover, research on appearance and representation of the surface.

The surface characterization was to be done using a fluorescent light microscope to confirm what was indicated in the reports and search for remnants of earlier finishes.

The "Zar" brand polyurethane specifies its composition on the label. It was decided to create a solvent system that would take advantage of the "Zar" structure. Lipolytic reduction would also be used as necessary.

A better understanding of how American furniture of this period would have first appeared was needed. Research would focus on documents of the 1760's - 1780's.

The new surface coating was to meet the following criteria:

1) To be as retractable as possible.

2) To be representative of what the original appearance was likely to have been.

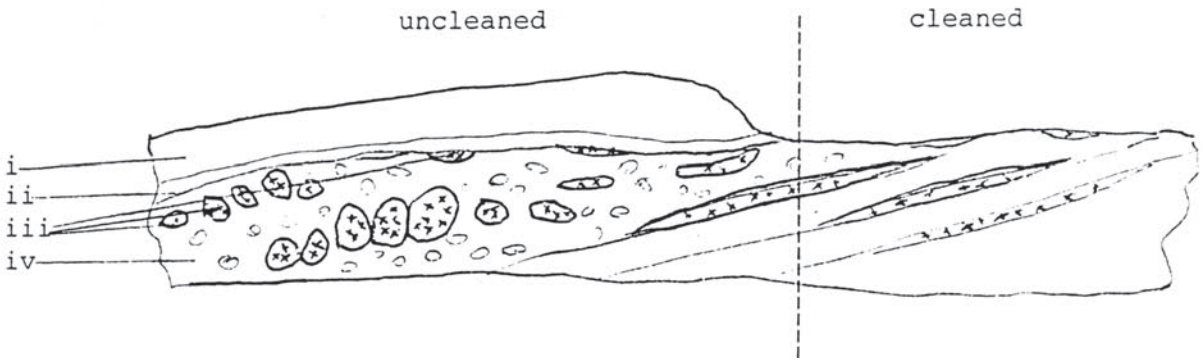
3) To have the appearance of an aged but well cared for surface. This requirement is grounded in the Winterthur Museum's philosophy that centuries old functional (even if high style) objects should not necessarily appear "like new".

4) To be in harmony with the room setting of the Blackwell Parlor of the Winterthur Museum.

An agreement on this proposal and goals by staff from several disciplines served to minimize any risk and maximize the potential for successfully meeting a variety of expectations.

IV. The Treatment

The information in the 1974 treatment report and the observations of the unaided eye were confirmed using fluorescence microscopy.[9] Samples for cross-sectional analysis were taken from the table top, along the aperature of the large split which bisects it, and one of the carved volutes on the "pie crust" decoration. The following surface stratification was observed:



200X, Ultraviolet light, no stain

- Layer (iii), which extends into the wood substrate (iv) to a depth of a few hundred microns, is autofluorescent. It also has a slightly positive reaction with Rhodamine B, a reactive fluorescent dye for lipids, indicating the presence of oil.[10] These characteristics indicate that this layer is a remnant of a natural resin drying oil varnish that had been applied early in the history of the table. Layer (iii) is depicted with xxx in the above diagram.

- Layer (ii), which is assumed to be the stain observed beneath the polyurethane, (see comments under Section II) is a heavily pigmented layer, with black inclusions, that diffuses into layer (i). A strongly positive reaction with Rhodamine B was also observed here, indicating an oil component.

- Layer (i), which, according to the 1974 treatment report is polyurethane has a blue/white autofluorescence, with evidence of some oil (speckled fluorescence when dyed with Rhodamine B), and has a glass-like, concoidal fracture on grinding. This particular polyurethane is largely a urethane pre-polymer esterified with linolenic, linoleic and palmitic acids.

It was decided that leaving the resinous material (iii) undisturbed beneath the oil stain (ii) and polyurethane (i) would be an important component of the treatment procedure. Preservation of this layer (iii), which is believed to be quite old, might provide subsequent saturation and color to the surface which would otherwise be lost through the solvent or mechanical reduction necessary for removing the polyurethane coating. Therefore, it was desirable to devise a cleaning system which would remove only layers (i) and (ii) and would leave the material of layer (iii) as intact as possible.

In small test spots, solvents with a wide range of solubility parameters and functional groups were tested for their efficiency in removing layers (i) and (ii); only a slight swelling in layer (i} was observed with the aromatic solvents, especially toluene and xylene. Proprietary paint remover compounds, usually methylene chloride/methanol based, would remove layers (i) and (ii), but they would also rapidly invade and solvate layer (iii), leaving an exposed and blanched substrate. The novel use of a solvent gel and enzyme/detergent system for cleaning was proposed. This would cause the swelling of the polyurethane coating via the extended contact time allowed by a gelled mixture of aromatic and ketonyl solvents. The solvent gel would be followed by selective lipolytic reduction, with an enzyme, of the modified oil portion of the polyurethane structure (the urethane pre-polymer is esterified with unsaturated fatty acids) as well as the oil based stain present on the surface beneath the polyurethane. The following was tried:

200 ml acetone
50 ml benzyl alcohol
25 ml water
8 ml Ethomeen C-25
1.5 g Carbopol 940

Ethomeen C-25 (a diethoxylated linoleate ester of a primary amine) is used as a weakly basic material to gel the Carbopol 940 in a solvent system (Carbopol 940 is a polyacrylic acid polymer, mw 4 million). The above mixture produced a semi-rigid gel solvent mixture which would rapidly swell and, in some cases, solvate the urethane coating (i) and some of the oil stain (ii). Gelling the solvent served to provide control of the material as well as preventing rapid evaporation of Volatile solvents. Where necessary, this solvent gel was followed by a wholly aqueous gel; 1% Hydroxypropyl Methyl Cellulose in water, 0.6% Tris HCL, pH 8.4, 1% Triton X-100, which contained upwards to 10 mg/ml of a Lipase. The enzyme gel then removed both the residual urethane and oil stain, leaving layer (iii) wholly saturated and undisturbed, as the recovered surface.

The solvent gel was applied to the surface with a cotton swab. Within 1-2 minutes of contact, the polyurethane became swollen and wrinkled (this is an obvious change, visible through the overlying clear gel). At this point, the gel was quickly removed with clean cotton swabs. The solvent gel was not allowed extended contact with the surface once the polyurethane coating had been swollen, as the solvents could eventually invade the resinous layer. The thick, oil stain layer between the polyurethane and resin provided some control. For this reason, great care was taken to prevent the gel from coming into contact with the cleaned surfaces nearby. When the gel was applied to the polyurethane layer, a fine-tipped brush was used to spread it to the edges of the cleaned areas, thereby minimizing the chance of inadvertent contact with the resinous coating.

When the polyurethane was removed, it was quite apparent that there was still residual polyurethane in the form of tiny islands, in addition to a reduced layer of the oil stain. These traces of polyurethane were rubbery in appearance and seem to be related to the pores of the wood. It would be impossible to use the solvent gel to remove the polyurethane from the pores without effectively stripping the surface, so the Lipase was applied to the surface with cotton swabs to remove the residues of polyurethane and oil stain. Contact time with the enzyme was not as critical, but once the stain was digested, the gel was removed from the resinous surface, as the resin seems to contain a small portion of oil. If, at this time, there was

still residual polyurethane on the surface which related to the pores of the wood, the tops of the tiny islands were simply sheared off to the level of the resin layer using a fingernail, being careful not to scratch the surrounding surface.

All surfaces were cleared with Shellsolv to remove any residues of the cleaning system, resulting in a surface ready for a new surface coating.

Research concerning the appearance of high style American Chippendale furniture in its first generation of use was necessary before a new surface coating could be applied to the table. Primary reference material of the 1760's - 1780's indicate that a wide variety of resins, oils and waxes were available.[11] Numerous American paintings of the latter half of the 18th century were examined to see how furniture of this type was depicted. Representative of this study is the portrait of Mrs. Ezekiel Goldthwait by John Singleton Coply 1771.[12] A tea table is shown in this painting with a continuous and highly reflective surface. The polish of the table top that Coply captured suggests a high resin content finish rather than wax or oil surface coating.[13] Other artists of the time, notably Ralph Earl and Charles Wilson Peale, represent furniture in a similar manner.

This information led us to plan for a finish that would initially be brought to a high polish and then toned down, thus meeting the criteria for a new finish as stated in Section III. Experience has taught us that the synthetic finishing materials have either working properties or visual characteristics that do not communicate the traditional appearance that was considered important from the outset of this project. The closest match for our desired results proved to be a “garnet” shellac. It is not known whether shellac would have been used as a singular resin on furniture in the 1760’s in Philadelphia.[14] In fact one study in particular suggests that it was not a common practice.[15] However, shellac can be worked in a manner that would be aesthetically consistent with the historical research previously mentioned. The use of a shellac was not to suggest that it was the main resin used in the original surface coating on this particular table, but rather visually similar to the finish that may have been first applied 200 or more years ago.

While agreement was reached that a shellac could be manipulated to achieve appropriate aesthetic ends, some concern was raised as to how it would change in time rendering it either less visually satisfying, less retractable or both. While these two concerns are not possible to accurately predict, they are important to address. There is enough experiential history within the profession to support the notion that a carefully crafted shellac finish will continue to visually represent a substrate in a consistent manner without becoming difficult to remove for an extensive period of time. It is known that cross linking in a shellac film can occur causing the molecular weight to increase, thereby making it not as readily soluble in alcohol as a new coating is.[16] The decision to use the shellac despite its propensity for some change was based on the informed belief that the reduced solubility of shellac in time will not exceed its ability to be removed with an alcohol, a resin soap based on the shellac structure, or another system that takes advantage of the complex and unique molecular make-up of the resin. In any case, the early remnant layer (iii) mentioned earlier would remain intact. The application of the resin of choice was the next treatment decision. The “re-filming” of the table was carried out first on the top.

The criteria previously stated for the new finish suggest that the coating should fill the pores yet not be too thick. To achieve this, a one and a half pound cut garnet shellac (1.5 lbs. resin [665 g] to 1 gallon

alcohol [3.79 liters]) made fresh from the shellac flakes was padded on with a linen cloth. Eight layers were applied over a period of one week. The garnet-type shellac was chosen as it has the more traditional darker hue yet retains a high degree of clarity. This grade of shellac resulted in the aged appearance that was hoped for.

Two final coats of shellac were applied in a non-traditional manner. The shellac was brushed first onto a pad of Volara (a cross linked polyethylene co-polymer foam), then pressed onto the surface creating a stippled effect. Working the finish with the Volara pad was particularly effective when the shellac was just becoming tacky. The result was a reasonably consistent and pronounced crazed surface.[17]

After five days drying time, the finish was rubbed out with 400 grit "wet-or-dry" abrasive paper to equalize the most pronounced texturing derived from the Volara application discussed above. 000 pumice in a mineral spirits suspension was then sprayed on the surface at 35 psi. This was done to further smooth the crazing in a uniform manner that would imitate the aging process. The results were controllable, subtle and effective. A light rubbing with rottenstone and mineral spirits was then carried out, particularly in the center of the table and on the highlights of the "pie crust."

One of the surface phenomena of an aged surface is the affixing of dirt and grime to the coating. An attempt to imitate this was made by selectively spraying on an alcohol soluble protein, Zein (2% solution), with an airbrush. This resulted in a faint matting of the surface as intended.

A final adjustment of the gloss was made with rottenstone and mineral spirits, rubbing selectively to highlight appropriate areas.

A missing visual component of the surface was the expected accumulation of finish, polish, dirt and grime that is a part of aged finishes. To imitate this, an acrylic resin, B-67, toned with raw umber, lamp black and terra rosa dry earth pigments, was applied in recessed areas. B-67 was chosen as it can easily be manipulated on a shellac surface without disturbing it. The B-67 toner can be removed conveniently with solvents that will not affect the shellac.

Two coats of wax were sprayed on and lightly buffed. The mixture was approximately 2 parts Behlen Blue Label Paste Wax (carnauba, bees and Japan wax mixture) and 8 parts mineral spirits. This was done with a spray gun to keep the wax layer thin and to have greater control over the resulting sheen.

The above description refers specifically to the top. The existing finish on the base, ca. 1981, was retained as an appropriate sizing layer. The finish on the base was applied and manipulated in the same manner as described for the top. The result was a uniform surface on the entire table that appears to be of some age yet well cared for.

Several principles common to the aspirations of the conservation profession became clear in the course of this treatment. Documentation of previous, although recent, treatment was critical to corning up with an appropriate course of action. Understanding the nature of the materials that needed to be removed, used or manipulated was essential to a specific treatment plan in order to insure minimal risk to the table both, now and in the future. Accommodating interpretive and art historical concerns in the treatment pro-

cess can be done without undo compromise from a conservation perspective. Establishing ahead of time a course of action for the table with a broad base of professional input was conducive to ensuring a successful project that was to meet a variety of expectations. Perhaps most importantly, following through on the original "game plan" for this project, despite some initial difficulty in achieving pre-stated standards, kept the quality of the product at an appropriately high level.

The table has now been on display in the Blackwell Parlor of the Winterthur Museum for six months since this project was completed. The appearance of the table has been accepted by several divergent points of view within the Museum achieving one of the major goals of the project. The report on file for the table suggests that the condition and solubility of the shellac be checked carefully every ten years. A sample of the finish system used has been put into the object's file for future testing should that be necessary.

End Notes

[1]William MacPherson Horner, Jr. Blue Book Philadelphia Furniture. Washington, D.C.: Highland House Publishers, 1977, p. 146, pl. 230. For more information on the table see file #60.1061, Registrar's Office, Winterthur Museum, Winterthur, DE 19735. See also: Charles Hummel. A Winterthur Guide York: Crown Publishers, Inc., 1976, p. 125, fig. 115.

[2]"Fine American Furniture, Silver, Folk Art and Decorative Arts." New York: Christies, January 25, 1986, lot #393.

[3]Microanalysis done by Gordon Saltar; see report dated May 14, 1980. The top in particular, has the appearance of a so called "Cuban" or "Santo-Damingo" mahogany (Sweitenia mahogani) but this cannot be determined definitively at this time.

[4]The x-radiographs of the feet indicate that pre-industrial screws were used to secure the casters. Such fasteners would be consistent with those used in Philadelphia in the 1760's.

[5]It is known to the authors, that alcohol was the standard finish remover used by the conservator who carried out the 1974 treatment.

[6]Ibid.

[7]See treatment report for #60.1061 dated June 4, 1974, Registrar's Office, Winterthur Museum, Winterthur, DE 19735. There is no explanation in the file as to why the polyurethane was chosen. However, it is the authors' understanding that the finish was chosen to protect the table from water damage that is likely to occur with cut floral arrangements. Apparently, aging and solubility tests, were done in 1974 before the polyurethane was chosen.

[8]See treatment report for #60.1061 dated June, 1981, Registrar's Office, Winterthur Museum.

[9]The microscope used was a Nikon Labophot with a 100W high pressure mercury, vapor lamp, source with Nikon filter block #V2-A.

[10]For more information regarding the use of reactive fluorescent dyes, see: Richard Wolbers and Gregory Landrey, "The Use of Direct Reactive Fluorescent Dyes for the Characterization of Binding Media in Cross Sectional Examinations," 1987 Preprints, Washington, D.C.: AIC, 1987, pp. 173-202.

[11]See Robert Mussey, "Early Varnishes," Fine Woodworking (July/August, 1982), pp. 54-57; and Robert Mussey, "Old Finishes," Fine Woodworking (March/April, 1982), pp. 71-74. Also see: Thomas Brachert, "Furniture Varnishes, Surfaces of Furniture," Maltechnik Restauro, Vols. I-IV, 1978; Vol. I, 1979. Written in German. Translation by Robert Mussey used.

[12]Carol Troyen. The Boston Tradition. New York: American Federation of Arts, 1980, p. 65.

[13]See account book and diary of Isaac Byington, Bristol, Connecticut, and Bedford Mills, Georgia, 1786-1799 for a primary account of the use of resin based finishes and the desirability of a high shine. Rare Books Room, Winterthur Museum Library, Winterthur, DE 19735. #6332, 74 x 137.

[14]Ibid. The reference that Byington makes about a shellac varnish is believed to date from 1794.

[15]See Robert Mussey.

[16]For more information on shellac, see: John S. Mills and Raymond White, The Organic Chemistry of Museum Objects. London: Butterworths, 1987, pp. 101-103. See also: James W. Martin. Shellac. Somerset, N.J.: William Zinsser & Co., Inc., pp. 441-478. This is a pamphlet published from a larger book by Zinsser on resins.

[17]The Volara technique was developed by Mark Anderson.

A Listing of Materials Discussed in the Paper in Order of Their Appearance in the Text

"ZAR" Polyurethane - United Gilsonite Laboratories, Scranton, PA. The label reads: Polyhydric Alcohol, partially esterfied with Linolenic, Oleic, Linoleic, Palmitic and Stearic acids modified with Tolylene Disocyanate, 43%; Colloidal Silica, 2%; Aliphatic Hydrocarbons 55%.

Rhodamine B Reactive Fluorescent Dye - Sigma Chemical Co., St. Louis, MO.

Ethameen C-25 - Arnaic Chemical Co., Edison, NJ.

Carbopol 940 - B.F. Goodrich, Cleveland, OH.

Tris - Sigma Chemical Co., Type VII, ex. candida cylindracea

Triton X-l00 - Sigma Chemical Co.

Lipase - Sigma Chemical Co.

Hydroxypropyl Methyl Cellulose - Sigma Chemical Co.

Garnet Shellac - Garrett Wade Co., New York (99P23.01).

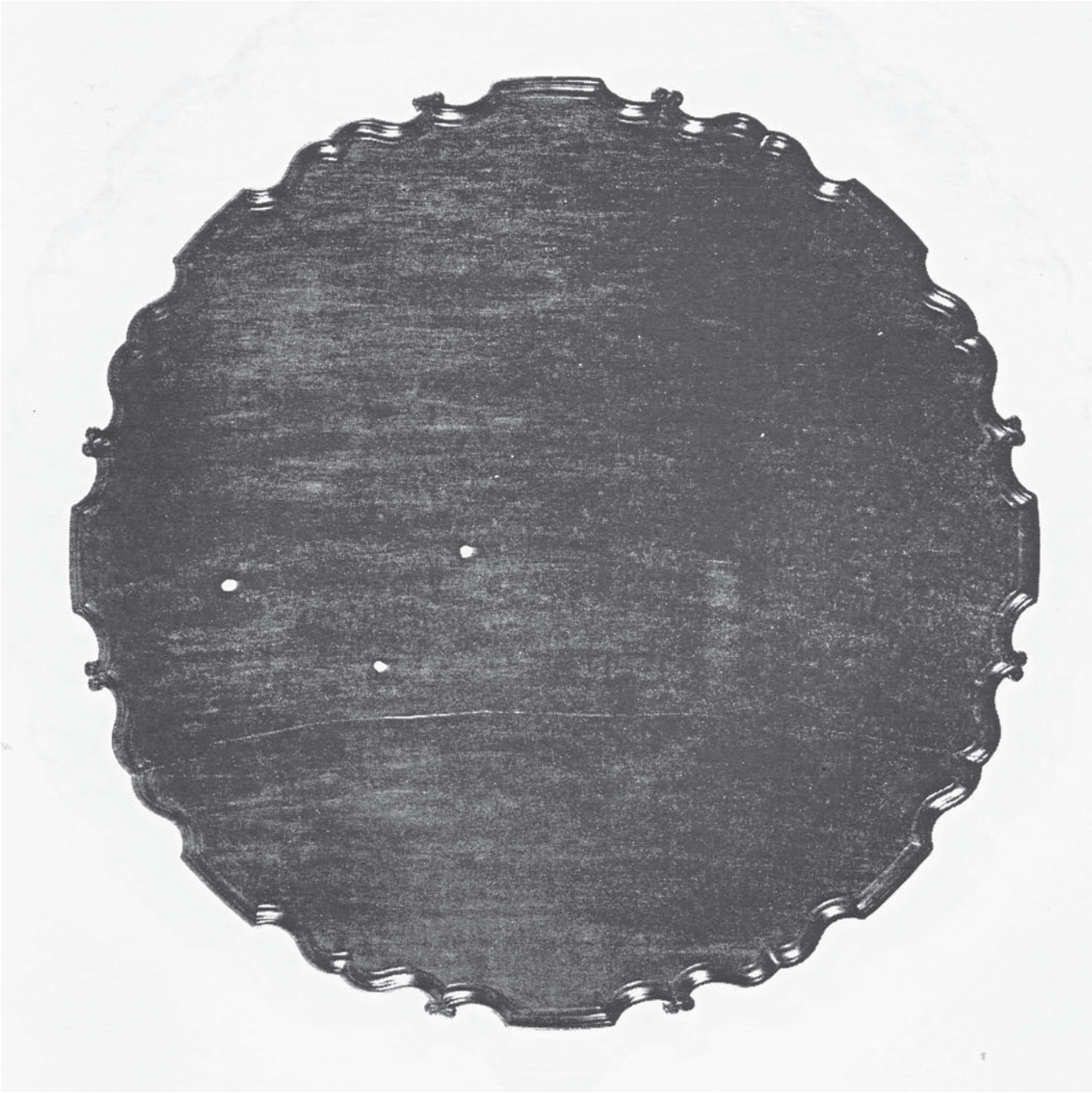
Alcohol - 90% Ethyl Alcohol, 5% Isopropyl Alcohol, 5% Methyl Alcohol.

Volara - Voltex, a Seksui Company.

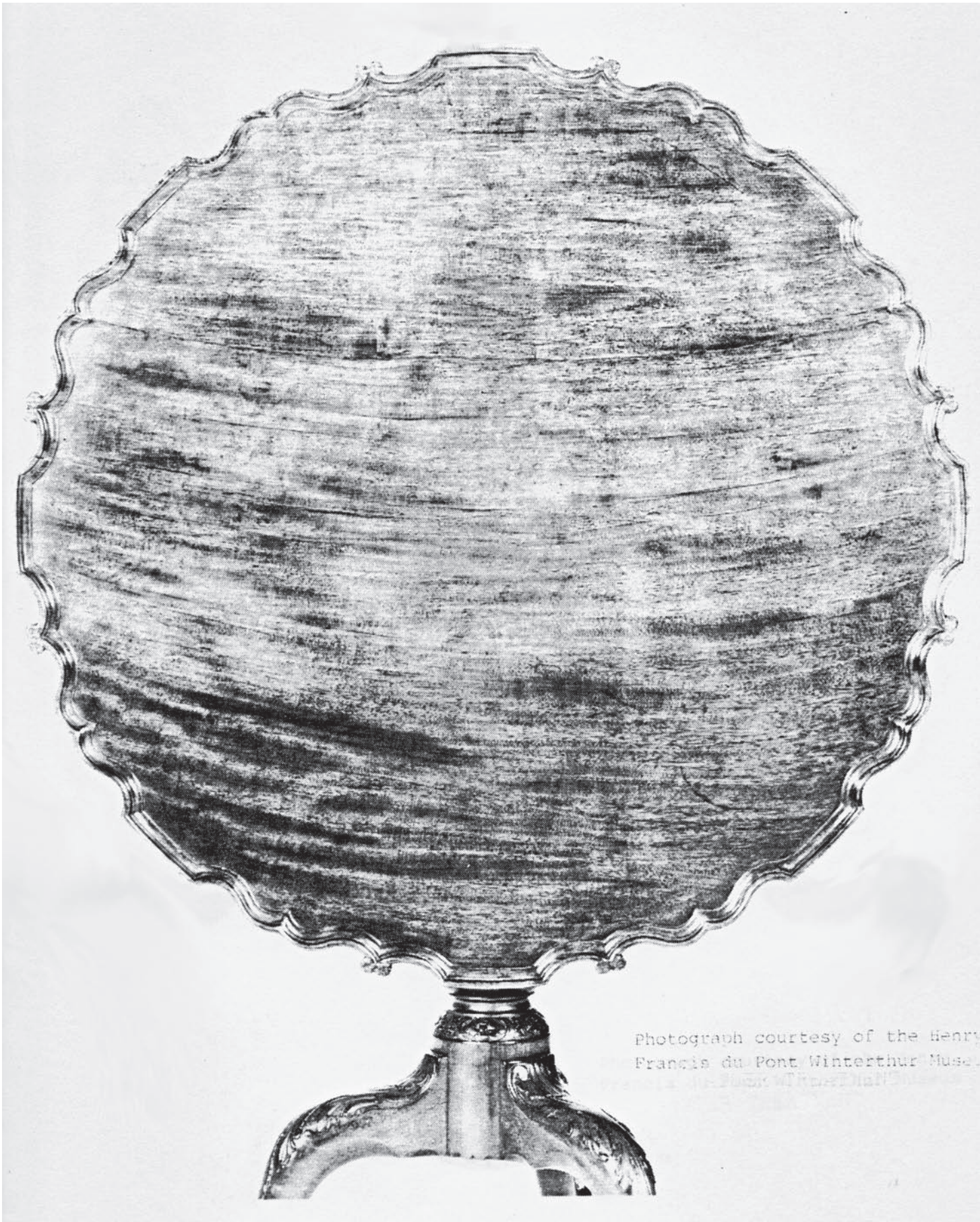
Zein - Aldrich Chemical Co., Milwaukee, WI.

B-67 - Rohm and Haas, Philadelphia; or Conservation Materials Ltd., Sparks, NV.

Behlen Blue Label Paste Wax - Behlen Bros., distributed through Garrett Wade, New York (B800-12455).



Photograph courtesy of the Henry Francis DuPont Winterthur Museum



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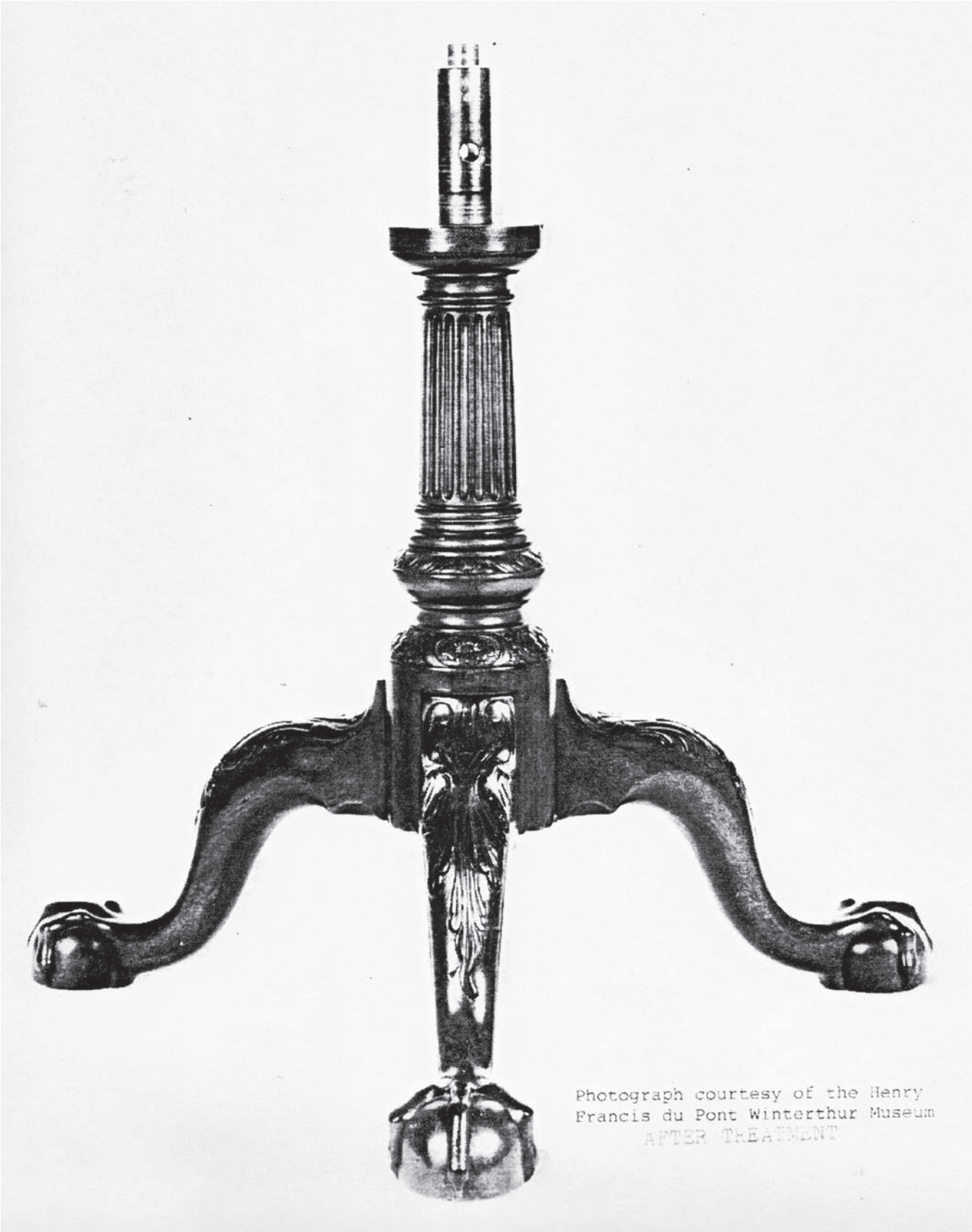

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AFTER TREATMENT

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