in the finish, later wax layers and the removable surface grime. It would have been nearly impossible to clean off the historical dirt without interfering with the rest of the layers, the evenness of the colour and the sheen of the finish. It was therefore decided to remove surface dirt and wax only, rather than trying to lighten the surfaces and remove the dark build up.

Conclusion

There is a wide range of potential treatments for any artefact that needs to be conserved. The goal in this case was to present this table as another example of the fine work done in Saint John, New Brunswick, fitting this into the context of a much-visited heritage building, and holding a position of relative glory. It was decided that the appearance of the deluxe mahogany top, as well as its precise and professional assembly, would be among the historic and aesthetic aspects to be restored during treatment. The base was allowed to tell another story; that of a once beautiful construction which had failed, through drastic fluctuations in wood moisture content. We concurred with the curatorial view that leaving the top showing the same deterioration as the base would diminish the interpretive story of the table. In turn, it was agreed that minimizing any intervention to the base would best present the story of the march of technology, modern heating and the Canadian climate. In this way, the top presents the story of Thomas Nisbet, the Scottish cabinetmaker who made his name in New Brunswick, while the base celebrates the fact that the Canadian climate can make its mark on even the highest art.

List of materials and suppliers

- Fish glue & Shellac flakes:
  Lee Valley Tools Ltd. P.O. Box 6295,
  Stn. J, Ottawa, ON K2A 1T4,
  Canada, 1-800-267-8767,
  www.leevalley.com.
- Potassium soap:
  Mohawk Wol-Wax:
  Richelieu Hardware,
  2772 Lancaster Road,
  Ottawa ON K1B 4S4,
  1-800-361-6000,
  www.richelieu.com

Notes

[1] T. Dilworth, 'Thomas Nisbet: a reappraisal of his life and work', in: *Material History Bulletin* 15, 1982. p.p. 77-82.

[2] G.H. Ryder, *Antique Furniture by New Brunswick Craftsmen*. McGraw-Hill, Ryerson, 1965, p.24.

[3] J. Hay, Unpublished Master's Degree research, Queen's University, Kingston Ontario, Canada, 1987.

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Ottawa. Ontario
K1A 0M5 Canada
Tel.: 00-2-613-998-3721
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Between grime and griffins: varnish reduction on a set of klismos chairs

Rian M.H. Deurenberg

Introduction

The American Wing in the Metropolitan Museum of Art in New York is currently undergoing major renovation and rearrangement of its period rooms and galleries. The late Neo-Classical galleries will be the first to reopen at the end of November 2006. Four painted Baltimore klismos chairs, acquired by the department of American Decorative Arts in 1965, were part of the new exhibition plan and required surface treatment.[1] (Figure 1)

In the period between 1815 and 1845, Maryland – and more specifically Baltimore – was thoroughly immersed in the Neo-Classical style.[2] Its counterparts in Europe were the French Empire and the British Regency styles, but 'Grecian' was the term most often used in the period to refer to furniture in this style. Furniture imported from Europe, as well as cabinetmaker's pattern books such as those by Thomas Sheraton, George Smith and Rudolph Ackerman, were very influential in stimulating the change in style. Baltimore – one of the largest cities in the nation at the time – had its own distinct furniture forms and decoration schemes.[3] This has been ascribed to influential individuals such as the architect Benjamin Henry Latrobe, as well as wealthy patrons and leaders in Baltimore itself.

Like the preceding Federal style, Maryland Empire furniture is characterized by a continuing emphasis on bold ornamentation, contrasting colors of wood, and a love of painted furniture. Baltimore 'fancy' or painted furniture was more sophisticated and popular than veneered furniture and commanded similar prices. It was often based on French designs, such as those of Percier and Fontaine, rather than English designs.[4] Winged thunderbolts, crossed torches and scrolled acanthuses are typical designs for Baltimore painted furniture. A frieze of griffins and scrolled acanthus leaves flanking a vase is another ubiquitous motif and has been associated with Plate 56 of Thomas Sheraton's Drawing Book of 1793.[5] Construction of Baltimore klismos chairs frequently incorporated turned front legs (instead of the more archaeologically correct saber legs), a wide curved tablet, turned rear stiles and a rolled front seat rail; although the latter two features are not found in these chairs.

Figure 1 One of four klismos side chairs (ffi65.167.8) at the Metropolitan Museum of Art, New York, before treatment (All illustrations in this paper are made by the author and are copyrighted by The Metropolitan Museum of Art).

The most sophisticated late Neo-Classical furniture in Maryland is documented or attributed to the firm of John and Hugh Finlay of Baltimore, MD. John, the older of the two brothers started the firm in 1799 as a coach painter, and by 1803 was advertising the firm together with his brother Hugh.[6] They soon had important commissions for sets of seating furniture for President James Madison and rich merchants such as Alexander Brown and James Wilson.[7]

After 1816, Hugh operated the firm by himself, but upon his death in 1830, John returned to the business until it closed in the late '30s, possibly because of changing tastes.

The ability to make business trips to England and probably France (in 1810) for inspiration and to collect new drawings indicates the brothers' important position in the market. During the war of 1812 their business – like many others – suffered, and in 1816 they were forced to let go of all sixty-eight employees (men, women and boys),

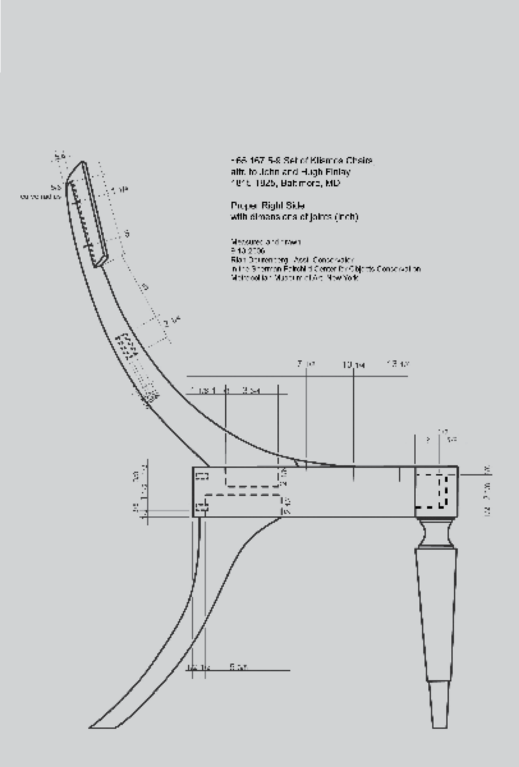

Figure 2 Adobe® Illustrator® CS2 drawing with joints and dimensions of the proper right side of the klismos chairs.

including chair-makers, coach and sign painters.[8] By the 1820s, the tide had turned and the firm was flourishing again, in part thanks to increased exports.

Ms. Gregory Weidman has eloquently described one of the chairs in the set as follows:
"That chair is the finest of all Baltimore painted chairs in the late neoclassical style. Some of the antique bronze motifs, such as the diamond flanked by stylized anthemions on the side seat rails, though not commonly seen, are nevertheless derived form Percier and Fontaine. The chair is one of eleven that descended through the [Arunah Shepherdson] Abell family of Baltimore, and were at one time used at Woodbourne. Since A.S. Abell [founder of the Baltimore Sun] did not come to Baltimore until 1837, the set of chairs may have originally come from Charles and Mary Ann Carroll of Litterluna in Baltimore County, whose granddaughter Elizabeth Laurenson (Mrs. Edwin Franklin Abell) lived at both that Greek Revival house and at Woodbourne.'[9]

Many other pieces have been attributed to the Finlay shop, based on stylistic and physical comparisons. Stratification comparison and pigment analyses related pieces from one set to a documented set and from there on, many more attributions have been made.[10] Stylistically, the attributed pieces often have similar designs, color schemes and ornamentation. Several pieces are closely related to the chairs, most

Figure 3 X-radiograph of the joints of the proper right seat rail with the rear stile and rear leg. Note the rough-cut mortises and the paint drips on the inside of the seat rails.

specifically the nineteen-piece ensemble. It was made for the Alexander Brown family of Baltimore between 1820-1830 and included twelve chairs, two benches, two card tables, a sofa, a dining table and a pier table.[11]

Examination

The assessment of the chairs started with a careful visual examination with and without ultraviolet (UV) illumination, followed by the taking of small samples from the painted decoration for cross-sectional stratification analysis. In addition to the usual examination report, technical drawings made with Adobe® Illustrator® CS2 served to document the dimensions of all parts and joints. (Figure 2)
X-radiographs revealed the dimensions of joints, the location and orientation of nails and screws, as well as the orientation of the grain in the tablet. (Figure 3)
The wood that is visible on the inside of the seat rails appears to be maple. Mortise and tenon joints (not pegged) connect all major structural elements, except for the tablet. All tenons are parallel with the grain direction of their structural element and have an upright orientation, except for the rear seat rail, which has double horizontal tenons. A sliding dovetail, or a double rabbet, and two screws secure the tablet to each stile. Square plugs hide the location of the screws on the front of the tablet. The chair maker achieved the curve of the tablet by steam bending. He cut the curved stay rail from a straight piece, however.
Details such as scribe lines, the location and angle of drilled holes, impressions of the original caning in the paint, drips of paint on the inside of seat rails, etc., were vital in determining the manner and sequence of assembly, painting and caning the chairs.
The sequence of assembling the chairs hinged on the physical evidence of the caned seat.

Figure 4 Inside of the proper left rear corner. Note the holes for the caning through the joints, the splashes of paint on the inside of the seat rail around the rear leg, the drips from painting the caned seat, and the scribe marks for the horizontal tenons of the rear seat rail.

The holes of the caning are at an angle and form a straight line on the top of the seat rails. This strongly indicates that the holes were drilled from the top of the seat rails down. The implication is that the top of the chair could not have been assembled at this point. The fact that several of the holes are partly covered by the rear stiles, confirms this premise. Since some of the holes cut through the joinery of the seat rails, the seat frame must have been assembled before drilling.
So far then, the evidence was straightforward and the chair was assembled as one would expect. However, the caning has left a distinct mark in the original paint. A complete stratification of ground and yellow paint layers being present, at least the bottom half of the chair must have been painted before caning. But were the top and bottom assembled when the seat was caned? To avoid shuffling the chair parts back and forth between chair-makers, painters, and caners, one would assume the chairs were completely assembled, including drilled holes, then painted and finally caned. The evidence indicates a different approach, however. The bottom half of the chair was assembled at the time of painting: there are large areas of excess paint on the inside and bottom of the seat rails around the legs, originating from painting the legs while they were attached to the frame. (Figure 4) Paint in the corners of the joints of the rear stiles and stayrail indicates that the top of the chair was assembled as a unit when the painter applied ground layers and yellow paint. But the

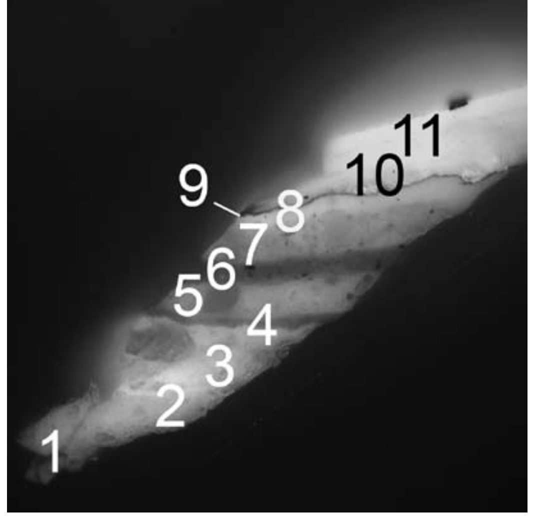

Figure 5 Photomicrograph of cross-section (sample #9-14) from gilt decoration of tablet. Layer 1: blue ground; 2: white ground; 3: transparent white ground; 4: yellow background; 5: white ground; 6: blue paint; 7: green glaze; 8: mordant; 9: gilding; 10: red glaze of highlights; 11: varnishes.

chair-maker appears not to have joined the top part to the seat yet, as there is paint even underneath the rear stiles.[12] Perhaps this sequence was preferred to facilitate caning the seat, but it would have involved a work schedule of partial assembly, painting, caning, and then final assembly.[13]

Stratification

Using a stereomicroscope, the painted surfaces were examined and a number of samples were obtained for cross-sectional stratification analysis using a compound light microscope.[14] The original ground, paint and varnish layers were clearly distinguishable, as were several later layers of varnish and paint. The overall background is a bright chrome yellow with ornaments in green and highlights in black, light green and possibly bronze powder.[15] The chairs are an example of the early use of chrome yellow on decorative painted objects. The pigment is generally thought to have been commercially available from the 1820s.[16]
Scrolls and mythological beasts, applied in 22kt gold on an oil mordant and different on each chair, adorn a dark green or 'verte antique' background in the center of the tablet.[17] 'Verte antique' is a predominant treatment of painted ornaments on pieces attributed to the Finlay shop.[18] Applying glazes and gold or bronze powders on top of multiple layers of green and black paint often served to achieve depth of color and the illusion of a corroded copper surface.[19] The dark green background of the tablet appears to have a more straightforward stratification of a white lead ground layer on top of the yellow background, followed by a blue paint layer and a green glaze. The blue layer appears to be mostly Prussian blue mixed with lead white and calcium carbonate, while the green glaze also contains chrome yellow, but little if any calcium.[20] The red and orange highlights on the gilding consist mostly of iron, probably in the form

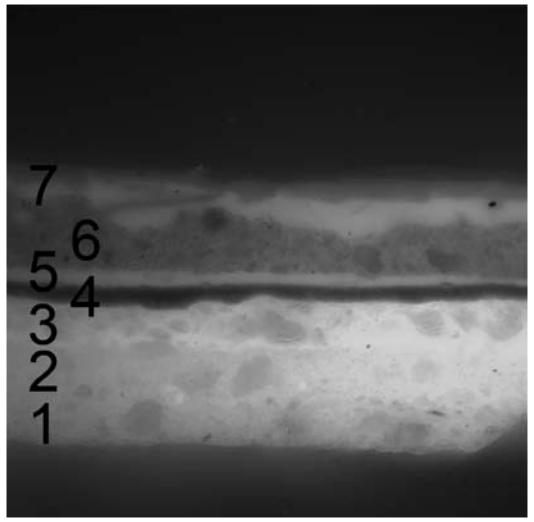

Figure 6 Photomicrograph of cross-section (sample #9-17) from paint dripped on the inside of the rear legs while painting the caned seat. Layer 1: blue ground; 2: white ground; 3: transparent white ground; 4: yellow background; 5: original varnish; 6: yellow paint of caning; 7: later varnish.

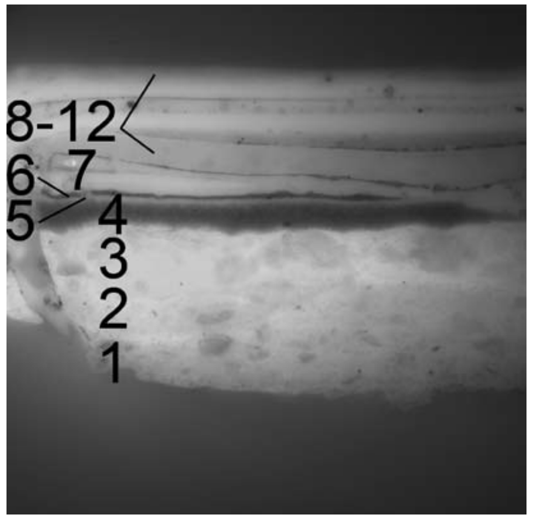

Figure 7 Photomicrograph of cross-section (sample #8-04) with yellow background and later layers of varnish, UV light with UV-18 filter for excitation between 390-420nm. Layer 1: blue ground; 2: white ground; 3: transparent white ground; 4: yellow background; 5: original varnish; 6: red glaze of decoration; 7: original varnish (two layers); 8-12: later varnishes.

of hematite, along with a relatively large amount of lead, possibly present as red lead or lead white pigment.[21] (Figure 5)

The stratification of the green ornaments, outlines and background was not identical everywhere, showing different layers of green and blue tones. Perhaps this indicates that different painters were responsible for the various aspects of the ornamentation, such as the yellow background, the outlines, the simpler rosettes and winged thunderbolts, the more complicated fasces or the gilt ornaments of the tablet. Presently, the tones of all ornaments are very similar, but they may have had subtle differences originally.

The stratification of the painted decoration included a mysterious light blue ground on all chairs, which was already visible in areas of loss.[22] This was one of the first layers of paint applied, but it is unclear what its purpose was. Most likely, the painter applied the blue layer as a ground coat for a green or blue final layer of paint.[23] For a reason unknown, the color scheme appears to have changed to a yellow background. Two layers of lead white paint were necessary to cover the blue paint and build up the yellow background.[24] In some areas, a very thin layer of white is present underneath the blue paint, presumably another ground layer. Since there is no finish layer (glaze, varnish, other paint) or dirt on top of the blue paint, it does not appear to ever have been the finished decoration. Using the blue paint purposely as a ground layer would have been a waste of pigment, especially considering the need for two more white layers to hide it underneath the yellow paint.

All pigments are contemporary with the attribution of the chairs. The original varnish appeared to be a natural resin varnish mixture, perhaps containing oil and shellac.[25]

Most of the painted ornamentation appears to be freehand, including the gilt mythological beast of the tablets. Since the designs of the floral scrolls match very closely, it is likely that the painter transferred the design from a (pricked) pattern. The other ornaments vary more widely in dimension and layout and are possibly entirely freehand, except for a general marking of the location.

Multiple layers of yellow paint are gathered in the holes of the caning and many large yellow paint drips on the inside of the seat rails remain as evidence of previous painting of the caned seat. In a cross-section from the inside of one of the rear legs, this yellow paint was clearly on top of the original varnish and below a later varnish. In both paints, analysis indicated the use of chrome yellow pigment in an oil medium. However, the chrome yellow pigment of the caning was more coarsely ground and mixed with lead white.[26] (Figure 6) All evidence pointed to the paint being early, if not original. There is no conclusive evidence that the paint of the caning is of a later date.[27]

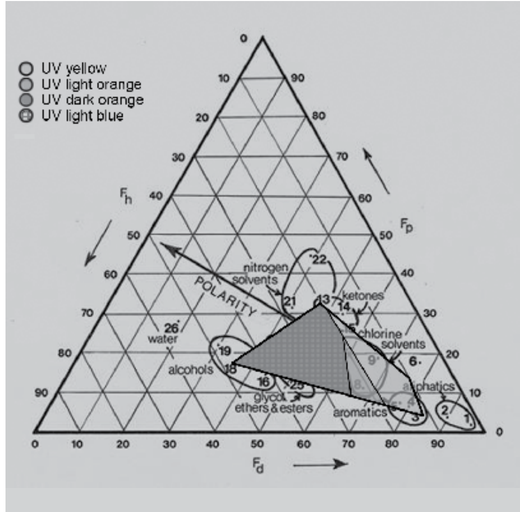

Figure 8 Teas diagram with textured areas indicating the solubility of the various layers of varnish. Courtesy Alan Phenix.[47]

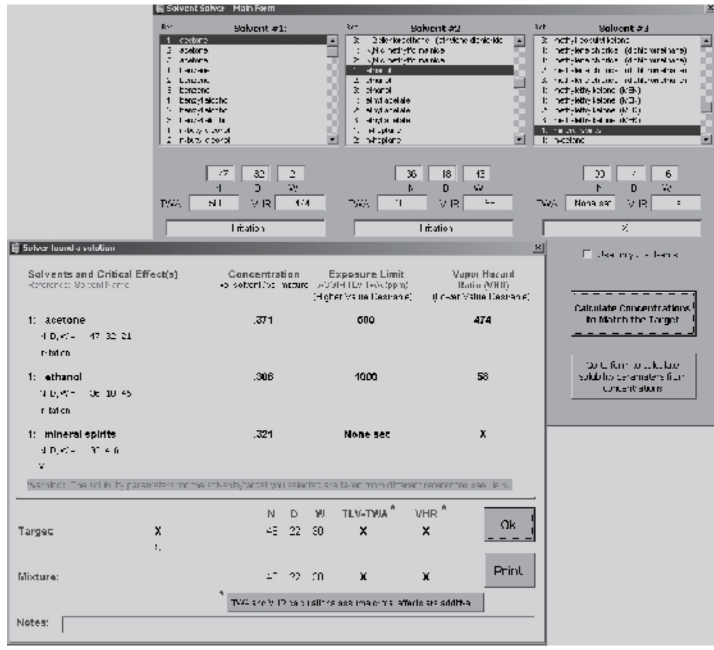

Figure 9 Print-screen image of the software program 'Solvent Solver: A Calculator for Working with Teas Fractional Solubility Parameters', developed by Mark Ormsby, Conservation Scientist at the National Archives and Records Administration. Courtesy Mark Ormsby.

Condition

In the three years following the acquisition, the Museum sent out all nine chairs for surface treatment. The treatment reports state that:

"Shiny varnish cut with powdered pumice, lost gesso areas refilled with gesso. Lost painting & scuffmarks painted in with Liquitex. Coated with shellac. All chairs given coat of Oz cream polish.[28] New cane seats antiqued with oil color in methacrylate."[29]

However, this was certainly not the first time the chairs have been refinished. As many as six later layers of varnish were present in some cross-sections. Some areas, such as the rear and inside of the legs, had evidently received less attention and had only one or two later layers of varnish. The varnishes had different colors of fluorescence, suggesting various compositions. This was confirmed to some extent by scientific analyses.[30] (Figure 7)

Present damage to the painted surface ranged from multiple layers of obscuring overvarnish, sometimes with large, disfiguring drips, losses in paint and ground layers, abrasion, dents and liberal overpainting, to damage from replacing the caned seats. Structurally, the chairs were all in good condition: some parts were slightly misaligned, but the joinery was secure and stable. The paint appeared to be securely attached to the surface.

All chairs had the same types of damage, but the extent of each type varied from chair to chair. Chairs #5 and #6 had the largest amount of paint loss, especially along the edges of the front legs, front seat rail and the tablet. Chair #8 was distinctly darker than any of the other chairs. It also had a severe craquelure in the finish of the tablet.[31] Apparently the tablet was finished at some point with a very thick layer of varnish, which developed large tensions while drying. The tensions resulted in fissures, which have gathered a lot of dirt over time. The craquelure was already present as alligatoring in a black & white picture of the chair from early 1966, before it was sent out for treatment on the finish. Previous inpainting of losses was often poor in both craftsmanship and color, obscuring the original painted decoration. For instance, the corners of the seat were completely overpainted, while the damage to the outlines and the painted ornament underneath (already overpainted, yet in acceptable condition) was relatively minor.

All of the outlines, as well as the sabots and concave parts of the turned front legs, had been repainted with a thick black paint to hide the wear on the edges.

A commercial company recaned all the chairs, except for #8, in January 1967. Black & white photographs, taken at the Museum in 1965 and 1966, showed broken seats and losses on the inside of the rear stiles. The caning on chair #8 was in good condition at that time. The photographs show that the insides of the rear stiles were already

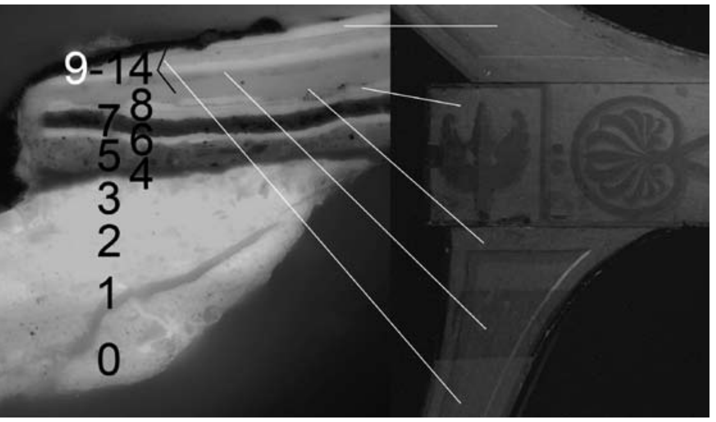

Figure 10 Varnish reduction on the proper right seat rail of chair #9 with revealed layers linked to the layers in a cross-section (sample #9-12), UV light with UV-18 filter for excitation between 390-420nm. Layer 0: white ground; 1: blue ground; 2: white ground; 3: transparent white ground; 4: yellow background; 5: blue paint; 6: original varnish; 7: green paint; 8: original varnish (three layers); 9-14: later varnishes.

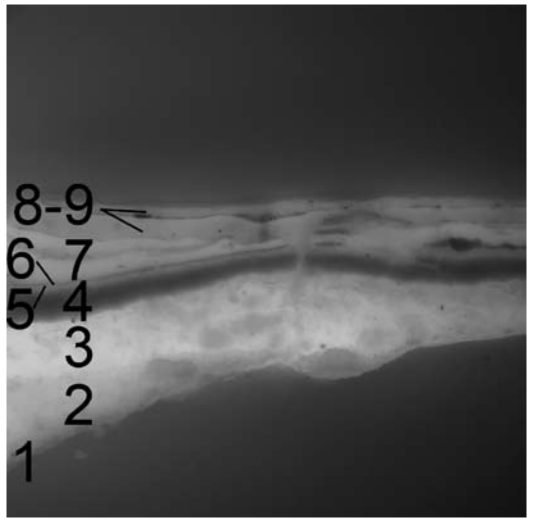

Figure 11 Photomicrograph of cross-section (sample #8-05) after varnish removal: compare to cross-section of sample #8-04 (Fig.7), which was taken at the same location, before varnish removal. Layer 1: blue ground; 2: white ground; 3: transparent white ground; 4: yellow background; 5: original varnish; 6: red glaze of decoration; 7: original varnish (two layers); 8-9: later varnishes.

Figure 12 Detail of the middle of the tablet (chair #8) during varnish removal. The dirt, gathered in the craquelure, was left behind after varnish removal (left side).

Figure 13 Chair #9 after treatment.

damaged, presumably from drilling out the pegs to remove the old caning. This suggests that the caning present at that time was already a replacement. The chairs received new cushions on several occasions between April 1966 and July 1972.

Treatment

Chair #9 appeared to be in the best condition and was treated first. To keep the project more manageable, the chairs were treated one at a time. The approach was similar for all chairs, but specific problems required minor modifications to the treatment. The goal of the treatment was to reduce the thickness and darkness of the later varnishes, while being sympathetic to age and wear.

Many small spot tests aided in determining the solubility of all layers involved, later as well as original.[32] Colored areas represented the data obtained from each layer in a Teas Chart.[33,34] (Figure 8) To remove one layer safely from another, the solubility parameters of the layers need to be sufficiently different. A Teas chart can help to visualize this premise, as a solvent (blend) can be used at a location on the Teas Chart where the solubilities of the two layers do not overlap. It was interesting to see that the varnish applied last had the widest solubility range, while the earlier overvarnishes required a more polar blend, probably due to oxidation. The earlier varnishes also had a much smaller range before the solubility parameters overlapped, which made removal of these varnishes more problematic.

The software program 'Solvent Solver: A Calculator for Working with Teas Fractional Solubility Parameters' made it easier to determine which solvent blend was worth testing.[35] This allowed solvent blends with similar Teas solubility parameters to be created, but using solvents that are less toxic, aggressive, or volatile.[36] (Figure 9) The blends had to be mixed quite precisely to selectively dissolve the varnishes.[37]

The choice of application technique, such as cotton swabs, gels, or poultices, made the specific stages of the treatment more controllable. In the case of the chairs, solvent gels often seemed fairly aggressive and surprisingly hard to control (even at low concentrations), as the effect was not directly visible and the layers were of varying thicknesses.[38]

For the first few layers, cotton or paper poultices under a small Mylar® (polyester) sheet provided a longer contact time of the solvent with the surface. During the later stages, the application of solvent blends proceeded with hand-rolled swabs. This technique allowed a quicker evaporation of the solvents, enabling a more specific removal of the layers.[39]

The benefit of using solvents is that they simply evaporate and do not leave a residue. Gel residues are sometimes hard to clear and often require rinsing with a slightly more polar solution than is incorporated in the gel.

The selective removal of varnish layers provided a number of treatment options for evaluation with the curator, Peter M. Kenny.[40] (Figure 10) It was most important to us not to over-clean the surface and remove the original varnish and patina. In fact, it was fairly easy to remove all layers of varnish and get a very bright painted surface, but it was not our intention to make the chairs look 'like new'. With the wear present on the chair, a crisp decoration would not be appropriate. Since most dirt was in and between the bottom-most layers, it was finally decided to remove all but the skimmer of the first overvarnish on top of the original varnish. (Fig.11) This approach left behind a surface with a suitable amount of wear and dirt. Having determined the level of varnish reduction, treatment of the remaining chairs proceeded faster, removing several layers at a time.[41]

Fortunately, the same solvent blend dissolved the extremely dark finish on chair #8. However, the dirt in the craquelure on the tablet of chair #8 proved extremely tenacious. Even after removal of the varnish – and thus the fissures – the dirt was left behind, caked onto the original varnish. Solvents or gels could not dissolve the dirt. As it was very disfiguring, we decided to mechanically remove the dirt from the gilt decoration, but not the yellow painted border and green background, as these are visually less important. Mechanical removal with a small scalpel blade under magnification proved to be time consuming, but rewarding. The dirt had damaged the red and orange highlights, which showed as losses after removal of the dirt. Minimal inpainting of these losses improved the appearance of the decoration considerably. (Figure 12)

Some of the surfaces on the third chair (chair #6), such as the tablet and the front seat rail, appeared to have an additional coating that is presumably the same as the 'stubborn layer' on chair #1, described by conservators in a JAIC article in 1997.[42] They too had a hard time finding a way to remove this dark and disfiguring layer and finally chose a 7-14% ammonium hydroxide gel in Carbopol. For the treatment of chair #6, however, a 4% ammonium hydroxide solution applied with poultices and swabs created a slightly less aggressive alternative with greater control. The extremely alkaline solution (pH 13) swelled the layer, after which it was removed mechanically. An even more diluted solution was used for clearing the residue with swabs. The treatment had no visible effect on the original varnish and paint, provided there was minimal mechanical action. A short contact time and the fast evaporation of the ammonium hydroxide solution limited penetration of the solution in the substrate. A cross-section after varnish removal showed no obvious damage, such as craquelure, to the original varnish.[43]

Resaturation with a thin coat of Paraloid B72 in Cyclosol 53 prepared the surface for inpainting the most obvious and disturbing losses with gouache and watercolors for final toning.[44] An acrylic medium, removable with Cyclosol, served to maintain saturation and fixation of the colors.[45] Regalrez 1126 in Solvent 340 completed the treatment, providing a final, protective coat on the chairs.[46]

The resulting surface appeared naturally aged with wear in plausible areas, such as the corners of the seat and the feet, and a thin craquelure pattern. With minimal inpainting and toning, the painted decoration was significantly more legible, with a uniform varnish and a soft sheen. (Figure 13)

Conclusion

The goal of the treatment was to reduce the thickness and darkness of later varnishes, while being sympathetic to the age and wear of the original surface of a set used and admired over a period of almost 200 years. Examination and interpretation of the physical evidence on the chairs resulted in a better understanding of the original assembly and decoration and the present condition of the chairs. This in turn provided clues about a possible work schedule in the renowned Finlay shop, from which came some of the best in painted furniture, including these icons of Baltimore painted klismos chairs. Taking X-radiographs and making detailed drawings was helpful in this process. UV surface examination in concert with cross-sectional stratification analysis was invaluable to understanding the complicated surface of multiple later layers of varnish and overpainting. In addition, this enabled keeping track of the varnish reduction during spot tests and treatment. Using the Teas diagram and 'Solvent Solver' program, three different options for the level of cleaning were created for discussion with the curator. In this way, we designed a treatment that was least intrusive but most effective in improving the appearance of the chairs, and thereby accomplishing the treatment goal.

Rian M.H. Deurenberg
Gegevens!

Abstract

In preparation for the reopening of the Neo-Classical galleries at the Metropolitan Museum of Art, New York, a set of four klismos side chairs, attributed to the Finlay brothers of Baltimore, MD (1815-1825), was examined and treated. Detailed drawings of the construction were made using X-radiographs. The evidence of fabrication was closely examined and conclusions about a possible work schedule in the Finlay shop were made. The treatment focused on selective reduction of the multiple later layers of obscuring varnish with customized solvent blends. The goal of the treatment was to create a more legible decorated surface, but not conceal the wear and age of the chairs.

List of materials

- Acetone, ammonium hydroxide, diacetone alcohol, ethanol and Stoddard solvent: Fisher Scientific, Fair Lawn, NJ 07410, Tel +1 (201) 796 7100
- Bioplastic with M.E.K: Ward's Scientific, Rochester, NY
- Cyclosol 53: Pride Solvents & Chemical Co of NY Inc., 6 Long Island Ave, Holtsville, NY 111742, Tel +1 (631) 758 0200
- Gloss medium and varnish: Liquitex®, PO Box 246 Piscataway, NJ 08855
- Gouache, Designers: Winsor & Newton, London HA3 5RH
- Keck #2: a solvent mixture of 20% acetone, 10% diacetone alcohol and 70% Stoddard Solvent
- Kraton™ G1650: KRATON Polymers U.S. LLC, 2982 Washington Boulevard, PO Box 235, Belpre, OH 45714-0235, Tel +1 (832) 204 5400, Fax +1 (832) 204 5461
- Paraloid® B72: Rohm and Haas, Canada Inc., 2 Manse Road, West Hill, Ontario, Canada, M1E 3T9
- Pomerantz #3B: a solvent mixture of 37% acetone, 31% ethanol, 32% Stoddard Solvent
- Pomerantz #4B: a solvent mixture of 35% acetone, 20% ethanol, 45% Stoddard Solvent
- Regalrez® 1126: Loos & Dilworth, Inc., 61 East Green Lane, Bristol, PA 19007, Tel +1 (215) 785 3591, fax +1 (215) 785 3597 (Kremer Pigments, New York)
- Tinuvin® 292: Ciba Specialty Chemicals, 540 White Plains Road, P.O. Box 2005, Tarrytown, NY 10591 – 9005, Tel +1 (800) 431 1900, Fax +1 (914) 785 4261
- Watercolor: Schmincke® Horadam® Aquarell, H. Schmincke & Co. - GmbH & Co KG, Fabrik feinster Künstlerfarben, Otto-Hahn-Straße 2, D-40699 Erkrath, Tel +49(211) 2509-0, fax +49 (211) 2509-461

Notes

[1] Under the curatorial supervision of Berry B. Tracey, the Metropolitan Museum initially purchased nine chairs with funds from the Mrs Paul Moore Gift in 1965. Between 1974 and 1994, the Museum deaccesioned five chairs to other American museums and collections in exchange for objects to complement the Museum's collection. The chairs went to the Baltimore Museum of Art (#2&4), the Munson-Williams-Proctor Institute Museum in Utica, NY (#3), the High Museum in Atlanta, GA (#7) and the Kaufman Americana Foundation (#1).

[2] The art historical background represented here was largely gathered from the following publications:
(1) Gregory R. Weidman, 'The Painted Furniture of John and Hugh Finlay', *The Magazine Antiques*, 143, no. 5 (May 1993), pp. 744–755.
(2) Gregory R. Weidman, Jennifer F. Goldsborough & Robert L. Alexander ... (et al.), *Classical Maryland, 1815-1845: Fine and Decorative Arts from the Golden Age*, Baltimore: Maryland Historical Society, 1993.
(3) L. D. Hastings & D. Bigelow, 'Collaborations Past and Present: A Classical Success Story', in: *Painted Wood: history and conservation. Proceedings of a symposium organized by the Wooden Artifacts Group of the American Institute for Conservation of Historic and Artistic Works and the Foundation of the AIC, held at the Colonial Williamsburg Foundation, Williamsburg, Virginia, 11-14 November 1994*, Los Angeles: The Getty Conservation Institute, 1998, p. 439.
(4) Baltimore Museum of Art, *Baltimore painted furniture, 1800-1840 / introduction and commentary by William Voss Elder, III*, Baltimore: Baltimore Museum of Art, 1972.

[3] Hastings & Bigelow, op. cit., p. 439: after the American revolution, Baltimore was 'becoming the third busiest seaport in the United States' and in Voss Elder, op. cit., p. 9: 'Baltimore in the early 19th century was America's fastest growing city and, for a brief period of time, the nation's third most populous urban center after Philadelphia and New York.'

[4] Charles Percier & Pierre Fontaine, *Recueil des décorations intérieures: comprenant tout ce qui a rapport à l'ameublement, comme vases, trépieds, candélabres, cassolettes, lustres, girandoles, lampes, chandeliers, cheminées ... miroirs, écrans, etc. ... / composé, par C. Percier et P.F.L. Fontaine, exécuté sur leurs dessins*, Paris: Chez les Auteurs, 1801 and 1812.

[5] Thomas Sheraton, *The cabinet-maker and upholsterer's drawing-book*, (original publication 1793), New York: Dover Publications, 1972, Plate 56.

[6] It is rather unclear where the Finlay brothers came from. The census records are ambiguous, listing both Maryland and England as their birthplace. Previous publications based an Irish heritage on a probably inaccurate conclusion in Robert Raley's *The Baltimore Country House, 1785-1815*, Unpublished Master's Thesis, University of Delaware, 1959, p. 175. I am grateful to Alexandra A. Kirtley, Assistant Curator of American Decorative Arts at the Philadelphia Museum of Art, for trying to identify the Finlay's birthplace.

[7] The president's set, designed by the architect Benjamin Henry Latrobe for the White House in 1808, consisted of thirty-six chairs, two sofas and four settees. It was lost in 1814 when the British burned the White House. It is the earliest documented set in the fully developed, archaeological phase of Neo-Classical furniture made in Baltimore. (Weidman, Goldsborough & Alexander, op. cit., p. 99).

[8] As another indication of the firm's size: in an advertisement of 1813 in the *Baltimore American and Commercial Daily Advertiser*, their manufactory had five floors, each of 28x30 feet (over 8x9 meters). (Hastings & Bigelow, 1998, p.440).

[9] Weidman, Goldsborough & Alexander, op. cit., p. 96.

[10] '...the red paint of the documented Ragan Chairs (Maryland Historical Society (MdHS) 87.132.1 and .2) and that of the pier table of the [Alexander] Brown set [MdHS 1992.8.3] have been shown by pigment analysis to be the identical combination of red lead and vermillion, and the painted decoration has been shown by microscopy to be identical in cross section, being laid down in the same order of glazes and grounds.' (Weidman, Goldsborough & Alexander, op. cit., pp. 101-102.

[11] Baltimore Museum of Art, 1972, p. 75.

[12] There is also a clear-cut break of the paint at the joint of the rear stiles and seat rails, which could indicate that the top and bottom section were not yet joined when the chair was painted. In addition, there are no paint splashes on the inside of the seat rail around rear stile, as do exist around the legs. However, the break in the paint may have occurred later as a function of the stress on the joints. Movement of the wood may have been an influence as well, since the grain direction runs vertically in the rear stile and horizontally in the seat rail.

[13] I am grateful to Randy S. Wilkinson, Conservator of Furniture at Fallon & Wilkinson

LLC, for his help in trying to understand the assembly of the chair based on the evidence.

[14] The microscope was a Zeiss Axioplan 2 with a SPOT Pursuit™ 4MP Slider digital camera by Diagnostic Instruments, Inc. The embedding medium was Bioplastic® with MEK hardener. Samples were collected with a scalpel blade.

[15] Adriana Rizzo (Assistant Research Scientist in the Department of Scientific Research at the Metropolitan Museum of Art) characterized the pigment in the yellow paint as chrome yellow ($PbCrO_4$) by Fourier transform infrared micro-spectroscopy (FTIR) and Raman spectroscopy. FTIR analysis also showed the presence of a lead drier and oil as a binder of the layer. Mark T. Wypyski (Research Scientist in the Department of Scientific Research at the Metropolitan Museum of Art) confirmed that the layer appears to be mostly chrome yellow, perhaps with a few lead white particles, by means of energy dispersive X-ray spectrometry in the scanning electron microscope (SEM-EDS).

[16] The mineral crocoite [lead chromate, $PbCrO_4$] was discovered in 1770, but its composition was not established until 1797. The artificial compound, which can vary in color from light yellow to orange-yellow, was first mentioned by Vauquelin in 1809. Commercial preparation of the pigment began about 1818, and probably by 1820 chrome yellow was already in common use in house paints.' (Richard Newman, Eugene Farrell, 'House Paint Pigments: Composition and Use, 1600-1850', in: *Paint in America, The Colors of Historic Buildings*, Roger W. Moss, editor, Washington DC: The Preservation Press, National Trust for Historic Preservation, New York: J. Wiley, 1994, pp. 279-280).
One of the earliest documents of the availability of this pigment in Baltimore is a mention in *The Federal Republican & Commercial Gazette* of March 23, 1812. (Peter L. Fodera, Kenneth N. Needleman, & John L. Vitagliano, 'The Conservation of a Painted Baltimore Sidechair (ca. 1815) Attributed to John and Hugh Finlay', in: *Journal of the American Institute for Conservation*, 1997, Volume 36(3), pp. 183-192).

[17] Analysis with attenuated total reflectance – Fourier transform infrared micro-spectroscopy (ATR-FTIR) using a Ge crystal suggested that the greenish translucent layer below the gilding in CS14 is an oil size containing lead-carboxylate peaks, which may derive from the use of a drier and from some lead white. The lead white and traces of calcite and Prussian blue were probably picked up from the layer below, which had not yet dried before the application of the size. (Adriana Rizzo).

[18] Weidman, Goldsborough & Alexander, op. cit., p. 102.

[19] Robert D. Mussey, Jr., 'Verte Antique Decoration on American Furniture: History, Materials, Techniques, Technical Investigations', in: *Painted Wood: History and Conservation, Proceedings of a Symposium Organized by the Wooden Artifacts Group of the American Institute for Conservation of Historic and Artistic Works and the Foundation of the AIC, Held at the Colonial Williamsburg Foundation, Williamsburg, Virginia, 11-14 November 1994/edited by Valery Dorge and F. Carey Howlett*, Los Angeles: The Getty Conservation Institute, 1998, pp. 242-254.

[20] Characterization by SEM-EDS included the following pigments in the stratification of the dark green background (Mark T. Wypyski): 'The green glaze (...) appears to contain a high percentage of organic medium and/or pigment. This layer contains a relatively large amount of lead, probably mainly lead white, along with small amounts of iron and chromium, possibly present as a mixture of chrome yellow and Prussian blue. Copper was not detected in this layer. The blue layer below the green glaze also contains a large amount of lead and some iron, and may also contain lead white and Prussian blue. The blue layer differed from the green glaze layer in also containing a large amount of calcium, probably present in the form of calcium carbonate. The white layer above the yellow is composed of lead white. The gilding was found to be a gold alloy of approximately 22kt, with 6.5% silver and 0.4% copper.'

[21] Analysis by SEM-EDS (Mark T. Wypyski).

[22] As in Fodera's JAIC article (1997) (see note 16), the blue pigment in the layer was identified as Prussian blue in a lead white matrix. Pigment identification was based on results obtained by ATR-FTIR, Raman spectroscopy (Adriana Rizzo) and SEM/EDS (Mark Wypysky). ATR-FTIR suggested oil as a binder of the layer.

[23] Ian C. Bristow, *Interior Housepainting Colours and Technology 1615-1840*, New Haven, CT: Yale University Press, 1996, p. 101.

[24] Identification by SEM-EDS indicated that the pigment in both layers of white paint was almost entirely lead white with some calcium carbonate. The top layer has a lower pigment concentration than the bottom layer. (Mark T. Wypyski).

[25] Analysis in cross section performed by ATR-FTIR (Adriana Rizzo).

[26] Analysis by FTIR and Raman spectroscopy (Adriana Rizzo).

[27] Brass pins under the rear seat rail presumably held in place a cushion, enhancing the comfort of the caned seat. The chairs made for the White House, mentioned earlier, had similar attachments for loose cushions, according to the Latrobe's drawings. Remnants of gilding or a 'changing' lacquer are present on some of the pins. Perhaps cushions were only used in winter, people sitting on the caning in warmer months. If both cushions and painted seats were yellow, it would be possible to maintain a similar decorative scheme.

[28] Oz® by Behlen Bros is a Cream Polish that '... cleans, polishes and protects. Just apply, wipe, and buff up a beautiful sheen.' It is '... non flammable, non abrasive, greaseless quick drying, and contains no silicones.' It is still available. (Product data from Behlen Bros Company).

[29] The chairs were sent out in two groups. The first treatment report dates from Dec 13, 1967, and records that a contract conservator treated chairs #4-7 and 9. The same contract conservator treated a second group of chairs (#1-3, 8), similarly in July 1968.

[30] ATR-FTIR analysis in cross section indicated unspecified natural resin mixtures in the later varnishes and more specifically shellac in the varnish with orange fluorescence. Additional pyrolysis-gas chromatography mass spectrometry (Py-GC/MS) of selected swab extracts of different fluorescence color confirmed greater presence of shellac in the orange fluorescent varnish and components of oxidized conifer resin, oil and beeswax in all extracts (Adriana Rizzo).

[31] The fact that this chair was in the second group that went out for treatment could offer an explanation for the different appearance of chair #8. In addition, a short note on the 1968 treatment record states that "chairs 1, 2, 3, 8 (were) first restored by (...)", presenting another possible explanation. Chair #3 does not have the severe craquelure.

[32] Solvents such as Stoddard Solvent, cyclosol, ethanol, acetone and mixtures of these were used for the spot tests. A good sequence for testing is a solvent from the class of aliphatic hydrocarbons, aromatic hydrocarbons, alcohols, ketones and finally water. Multiple solvent blends of the same solvents but different mixing ratios, starting with a non-polar and ending with a highly polar solution, can be very effective as well. (Shayne Rivers & Nick Umney, *Conservation of Furniture*, Oxford; Boston: Butterworth-Heinemann, 2003, p. 505 & 524).

[33] There are several models that describe and compare the physical properties of solvents. The Teas Chart (1968) is the most widely used in conservation. It makes use of three parameters: dispersion forces, hydrogen bonding and dipole bonding. A few characteristics are not reflected in this model, however, such as the aromaticity, acidity or alkalinity of a solvent. Obviously, these can have a strong effect on – for instance – the saponification of oil-based layers. Evaporation rates or interactions between solvents are also not taken into account. When making a solvent blend, it should be kept in mind that solvent ratios in a certain blend can change rapidly upon exposure to air. Airtight containers are essential for blends with fast-evaporating solvents such as acetone. (Rivers, 2003, pp. 518-524).

[34] Research has indicated that the swelling region for oil paints does not necessarily form a continuous area on the Teas Chart. (Alan Phenix, *'The Swelling of Artists' Paints by Organic Solvents and the Cleaning of Paintings: Recent Perspectives, Future Directions*', in: *2002 AIC Paintings Specialty Group Postprints, Miami, Florida, June 6-11, 2002*, pp. 71-86). The number of solvent tests executed on the varnishes of the chairs was not sufficient to confirm this premise for resin-based varnishes.

[35] Mark Ormsby, Conservation Scientist at the National Archives and Records Administration, developed the program, which is available for download at the Conservation OnLine (CoOL) website: http://palimpsest.stanford.edu/packages/solvent_solver.html

[36] For example, traditional Pomerantz #4 (Acetone 25%, Shell Sol 25%, Cellosolve 50%) was replaced with a new blend, Pomerantz #4B, containing Acetone 35%, Ethanol 20% and Stoddard Solvent 45%.

[37] It should be noted that, even though layers appear to be visually intact, scientific analysis of soluble components of oil paint films indicates that even so-called mild solvents, such as Solvent 340, have a leaching effect on oil-based paint films. (Ken Sutherland, 'Solvent-extractable Components of Linseed Oil Paint Films', in: *Studies in Conservation* (2003), pp. 111-135).

[38] The addition of a detergent in the gel or solvent solution did not appear to have an increased effect on the cleaning ability.

[39] Summary of varnish reduction: Top layer with a dark yellow fluorescence: Keck #2 on paper tissue compresses under Mylar® (polyester) sheet for softening; subsequent removal with

cotton pads and swabs. Layer with a bright orange fluorescence (shellac): Pomerantz #4B with cotton swabs. Layer with a dark orange fluorescence: mixture of Pomerantz #4B and Rabin #2 or only Rabin #2 on swabs. Finally: Rabin #2 on cotton swabs for rinsing surface and to reduce occasional blanching and the visibility of cracks in the darker areas of the decoration. Except for the layer with the bright orange fluorescence, which was characterized as shellac, the later varnishes were composed of unspecified resinous material.

40 Peter M. Kenny is Curator of American Decorative Arts and Administrator of the American Wing.

41 A solvent blend with the same Teas solubility parameters as traditional Pomerantz #3 dissolved the varnishes in this treatment. Instead of having Acetone 20%, Shell Sol 20%, Cellosolve 60%, this blend contained Acetone 37%, Ethanol 31% and Stoddard Solvent 32%.

42 The article discusses treatment of chair #1 (ffi65.167.1), after the Kaufman Americana Foundation had acquired it in 1994.

43 Highly alkaline solutions may cause saponification of oil-based layers, especially aged binding media that have become more acidic. FTIR analysis indicated that some saponification had occurred in the probable oil-containing varnish layer beneath the coating. However, this phenomenon was found on one occasion in a varnish layer still protected by a later coating. It cannot be determined whether the ammonia solution had an adverse effect. (Adriana Rizzo).

44 The barrier layer contained 15 g Paraloid® B72 in 100g Cyclosol 53. Cyclosol doesn't appear to affect the original varnish and paint. The varnish is easy to apply thinly and brush marks disappear as the solvent evaporates slowly. (Arlen Heginbotham, 'What's Old is New: B-72 and the Treatment of Degraded Furniture Finishes', in: *Postprints of the Wooden Artifacts Group*, 2001, pp. 41-56).

45 In UV, the paint fluoresces black in the presence of sufficient pigment, or very bright yellow if the paint is rich in medium, such as the toning layers.

46 The varnish contained 20g Regalrez® 1126, 2.0 g Kraton™ G1650, 0.4g Tinuvin® 242, 50 g Solvent 340. It has a different solubility than the paint used for inpainting, is easy to apply and gives a sympathetic gloss. It has found wide application in the field of paintings conservation as a top varnish, but less in conservation of furniture and objects. (Hans Piena, 'Regalrez in Furniture Conservation', in: *Journal of the American Institute for Conservation*, 40(1), 2001, pp. 59–68).

47 The original Teas chart used for this image was published in: Alan Phenix, 'Solvent Abuse: Some observations on the safe use of solvents in the cleaning of painted and decorated surfaces', in: *The Building Conservation Directory*, London: Cathedral Communications, 1997.