

Finish NotesTM

The newsletter of architectural finishes investigation
from Frank S. Welsh company

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Frank S. Welsh, P.O. Box 767, Bryn Mawr, PA 19010
Tel: 610-525-3564 Fax: 610-525-1333

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WELCOME TO OUR NEWSLETTER

There is a variety of interesting topics related to the conservation of historic artifacts. This issue is devoted to several of them. We feel it would be valuable to discuss and share them with our many clients around the country.

We would like to publish information about your projects to share with others. Please call us with any questions and we will answer them in print and help when you call.

Freedom Statue Facelift Finished

by Linda Merk-Gould

The Statue of Freedom is a weatherworn bronze beauty that surmounts the dome of the U.S. Capitol in Washington, D.C. Installed in 1863, it is a 15,000-pound, 19 1/2-foot statue by sculptor Thomas Crawford and is considered the symbol of America's characteristic love of freedom.

Removed by Helicopter

The bronze statue, which sits upon a cast iron base, depicts a robed woman wearing an eagle helmet, clutching a sheathed sword in one hand and a laurel wreath of victory in her other. The wreath rests on a shield with 13 stripes, representing the 13 original colonies. For conservation treatment, the bronze statue was separated from the base and a helicopter hoisted it down to the Capitol's East Front Plaza. The project lasted throughout the summer of 1993. The team of conservators for Fine Objects Conservation, Inc., headed by Linda Merk-Gould, included Cameron Wilson, Nancy Persell and Hope Gumprecht.

Before removal by helicopter, research was undertaken to answer key questions concerning not only the preservation of the statue but also the artist's original intent; that is, the original color and appearance of the metals. For the bronze this meant the patina; for the cast iron base it meant the color of the original paint. Since the paint color would have been matched originally to blend with the original patina that the artist put on the bronze, the paint color analysis was critical.



Restored Statue of Freedom awaits helicopter trip to Capitol dome.

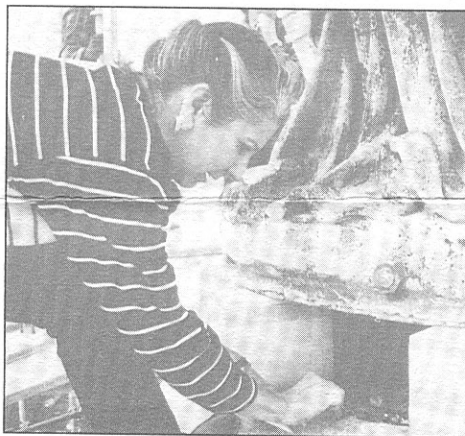
Bronze Patina

Research of historic records collected by the office of the Curator of the Capitol revealed only the reference to a "bronze-green" color in correspondence from Thomas U. Walter, Architect of the Capitol. However, a list of chemicals that were used suggested that the original appearance of the statue was not a highly reflective one—i.e., polished bronze. Patinas on metals are obtained by applying different chemicals in varying concentrations and temperatures. A turn of the century document referred to a verdigris color that was revealed when a white deposit was washed off the statue and the cast iron base during a maintenance project at the time. An undated, hand colored postcard of the "Freedom Statue" in the National Museum of American Art's Library shows it to be a medium dark brownish green.

These historic references helped to define the color range from brown to green.

Painted Iron Base

Completing this research allowed the investigation of original paints on the cast iron base to proceed. Unfortunately, it was sandblasted in 1959 to bare metal. This meant that the only place to find original paint evidence was now in areas that may have been protected. Such an area was located on several joints between a stem holding a wreath to the pedestal. Linda Merk-Gould took the samples and sent them to Frank Welsh for microanalysis of the layers and for color evaluation.



Linda Merk-Gould restores the U.S. Capitol's bronze "Statue of Freedom" to its original appearance.

Frank Welsh found that the iron was originally prime painted with a moderate reddish brown, red iron oxide paint. A second prime of white, oil, lead-based paint was next. The third and final coat, a lead-based oil paint, was the original olive green. He visually matched the olive green color and took a spectrophotometric reading of it. He also provided Linda with an exact color sample along with the CIE L*a*b* color reference values. A crosssection of the sample was made and a photomicrograph was taken to document the original coatings and their colors.

With the original paint color identified on the cast iron base, the statue was then cleaned and repaired. We noticed in the

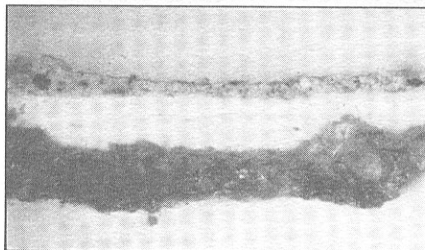
cleaning process that the heated bronze (without the use of chemicals) developed an appearance that was consistent with the post-card color and the paint analysis color.

Patina Experiments Contribute to Decision Making

After the cleaning, patina experiments were carried out on the bronze statue itself. Typical to most restoration projects of this nature, the experiments were done and then reviewed by the assembled conservation teams as well as by the client. Of the five samples prepared, the one selected by the client, Mr. George White, current Architect of the Capitol, was a multi-layered combination of greens and browns applied by both brushing and spraying chemicals onto a propane-heated surface. The resulting bronze-green color appears greener on an overcast day and browner in full sunlight.

The Statue of Freedom was helicoptered back to its original location on the dome of the U.S. Capitol in October, 1993. Its present color is visible to all and, ironically, directly related to what was visible only microscopically before the conservation began.

Linda Merk-Gould is an objects conservator and is the proprietor of Fine Objects Conservation, Inc., Westport, CT. Questions concerning this restoration can be directed by FAX to her at 203-222-2235.



Crosssectional Photomicrograph: The top layer is the original olive green, lead-based, oil finish paint. The middle layer is the 2nd prime coat, a white lead-based oil paint. The bottom layer is the red iron oxide primer on the metal.

Historic Metal Roofing

Penelope Watson, AIA, with Watson and Henry Architects, Bridgeton, NJ, recently consulted on the investigation of six early 20th-century structures at Whitesbog Village — once a huge cranberry producer — in central New Jersey near the Pinelands. Penny found a portion of painted original metal roofing from the Barrel Storage House. She sent us a sample and asked us to identify paint color, type of metal and any manufacturer's finish on the metal such as galvanizing.

We first analyzed the red iron oxide paint on it and identified the match in the CIE L* a* b* and Munsell Color Systems. Our examination of the metal disclosed that it consisted of two layers — a thin soft metal surface on top of a hard metal. The hard layer was determined to be iron from the evidence of rust on both sides and was magnetic.

For the soft surface metal, we did several microchemical tests and found it reacted negatively in a test for zinc (used for galvanizing) but reacted positively for tin. We reacted cesium chloride in solution with the sample and observed tiny precipitated crystals of cesium chlorostannate, confirming that the soft metal was in fact tin.

Welsh Tin

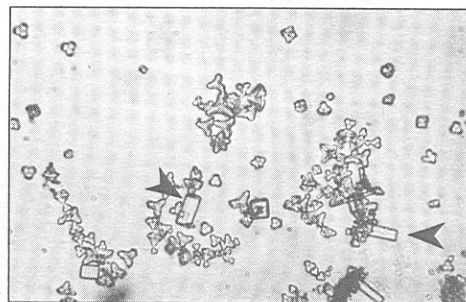
Tin-coated iron roofing? We made a confirming call to Andy Johnson at Monticello. Andy helped supervise the multi-million dollar roof restoration there last year. Did he know of roofing made from tin-coated iron? "Of course," he said. "That is what Jefferson used on the Dome exterior."

According to Bill Beiswanger, Architectural Historian and Director of Restoration at Monticello, Jefferson ordered tin-coated iron roofing and referred to it as "Welsh tin." Jefferson felt that the tin-coated iron roofing would last longer if it was not painted. Hence the restored roof at Monticello is unpainted.

A good source for information on historic metal roofing is the article on roofing by Diana Waite in *Building Early America*, edited by Charles E. Peterson, Chilton Book Co., Radnor, PA, 1976. Another source is an article written by Charles E. Peterson in *The Smithsonian Journal of History*, Vol. 3, No. 3, Fall 1968.

Photomicrograph:

Arrows point to thin square platelets, tiny cubes and skeletal forms of precipitated crystals of cesium chlorostannate and confirm tin as the coating over iron — the original roofing from the early 20th c. Barrel Storage House at Whitesbog Village in New Jersey. The microchemical test is described in



Chamot and Mason's *Handbook of Chemical Microscopy*, Volume 2, 1940.

California Stagecoach — A New Look At The Old West

by Sarah J.R. Murray

In June 1993 the Balboa Art Conservation Center (BACC) worked on a joint project with the Frank S. Welsh Company investigating pigments used to paint a mid-19th century stagecoach belonging to the Gene Autry Western Heritage Museum in Los Angeles, California.

The stagecoach is of particular interest. Dating from the middle 1850s, it may be the oldest example surviving from the California Stage Company. Its condition is remarkable and it appears that many of the old finishes remain. Since it is now covered by thick darkened varnish, the museum's curators are pursuing an investigation of the original colors and appearance.

Based on the study of other stagecoaches, the curators speculated that the body and undercarriage were painted yellow. There presumably would have been lettering, probably in gold, and decorative panels showing landscapes. On one side of the stagecoach a green, painted design was visible, but the varnish completely obscured everything else.

Sampling To Find Original Paints

The decision of where to take the samples was governed by two factors: 1) the areas of particular interest to the curators, and 2) ethical considerations, in that samples may only be taken from areas of damage and must be of a maximum size. I spent a day on-site taking samples. Averaging one-sixteenth of an inch in size, the samples were bigger than I would normally take from a painted object.

Samples were taken as far as possible from representative areas to answer the curators' questions. But because samples could not be taken from undamaged areas, such as the center of the side panels where decorative landscapes may be painted, some questions remained unanswered. Paint crosssections, being a destructive form of analysis, are not always the preferred solution to such problems.

I described and documented the sites, and carried the samples back to the lab at BACC in gelatin capsules. Then I spent a day in the lab preparing for analysis. I sent a set of my samples to Walter C. McCrone in Chicago for pigment analysis, who in turn asked Frank Welsh to examine them.

Some of the material was embedded in polyester resin, ground and polished to show the paint layers in crosssection. At the BACC lab I studied the paint crosssections and made drawings showing the layer structure. Looking at the samples in polarized and ultraviolet light under high magnification, I could discern the many layers that made up the complicated structure. The UV light makes the various media of clear coatings and paints fluoresce

differently. High magnification using regular illumination allowed me to observe several larger pigment agglomerates within the original paint film. Frank Welsh's pigment analysis helped me understand the nature of those pigments and consequently their colors more fully.

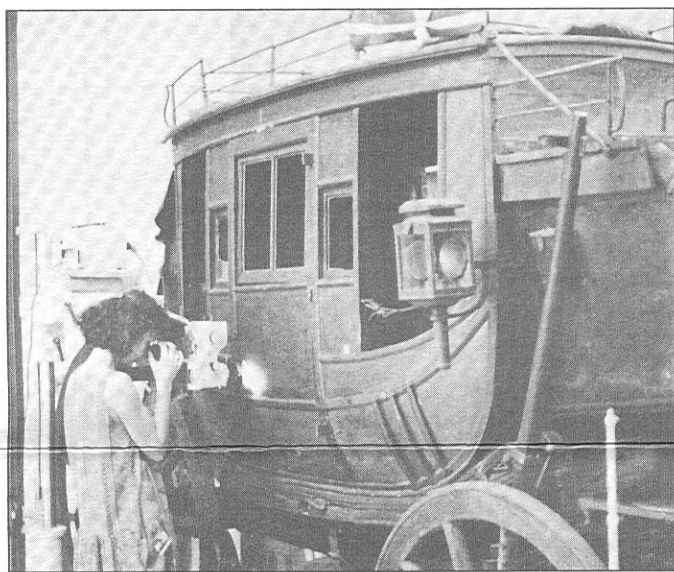
Yellows and Gold Leaf

All the samples from the stagecoach body showed an original white primer of varying thickness, covered with pale grey and thick, bright yellow paint layers. The wheels and undercarriage of the stagecoach also were painted yellow but were of a paler tone. Gold leaf was used for decoration, found above the door and window — where cleaning tests showed evidence of lettering — and below the door, where there may be a decorative border.

With the exception of gold, the pigments used were cheap and commonly available. Pigments identified in the original paints were:

- white lead: for priming and in mixtures with other colors.
- yellow ochre: for a very bright yellow finish coat and also used mixed with white for a pale yellow finish.
A microchemical test for iron confirmed that the pigment was yellow ochre (an iron oxide) and not chrome yellow.
- lamp black: used in an original blue grey color and also in a later greyish red.

Later greyish-red paint layers with varnish on them appeared in a number of samples. Frank Welsh pointed out that this structure in furniture and architecture is typical of graining that imitates real or decorative wood. With a stagecoach, however, there is a chance that it might be something different. Only a large exposure window of the actual surface would allow us to know for certain. These later layers along with the dirt that is associated with them strongly suggest that the coach was repainted, at least partially.



Conservator Sarah Murray uses a stereomicroscope on a rolling stand to examine and sample paint finishes from this 1850s California stagecoach at the Gene Autry Western Heritage Museum in Los Angeles, California.

Other colors may have been used in the panels, such as the green design, framed by the gold border. Additional samples and analyses will yield more information about this and the original finishes and how much actually remains on areas not yet sampled. At the same time I am looking at other stagecoaches, both before and after conservation, and researching the techniques and materials used in their decoration.

Sarah Murray is an associate paintings conservator at the Balboa Art Conservation Center (BACC) in San Diego, California and can be reached at 619-236-9702.

Harriton's Road Cart — The Little Red Sulky

by Bruce Cooper Gill

An 1890s road cart or sulky recently was given to the Harriton Association of Bryn Mawr, PA. Two wheeled vehicles, gigs, carts, and chaises were regularly used at Harriton (the restored 1704 Home of Charles Thomson, only Secretary to the Continental Congresses) from the 1700s through the early 20th century. This road cart was used locally to collect township taxes for nearly 25 years, from the early 1890s until 1914.

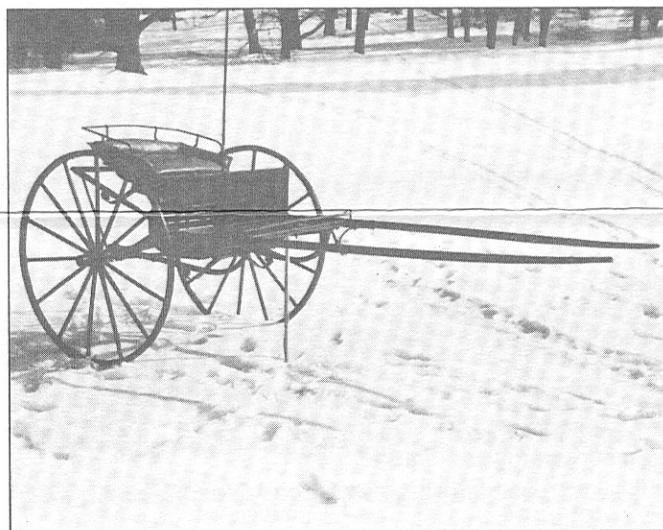
The cart needed extensive repairs to the ash frame and complete disassembly and removal of metalwork. One shaped shaft was repaired and the singletree and two "S" shaped seat and floor supports were replaced. The wooden-spoked and iron-tired wheels were sound and reasonably true. The original manufacturer remains unknown.

Frank S. Welsh did a complete microscopical paint color and finish analysis and found that it originally was painted bright red with a black seat box—the whole then covered in a gloss varnish. There was no evidence located to indicate any original pinstriping. Later color incarnations were dark green and finally maroon with black pinstripes. The poor condition of the surviving paints necessitated complete finish removal although some paint evidence was left on the underside of the front crossbar for future reference.

The original red and black finish colors were matched in Pittsburgh Paints exterior oil-base enamel. Three thinned coats were applied and wet sanded between coats. When the paints were completely dry, four coats of Bartley's paste varnish were wiped on.

With the road cart reassembled and repainted, bright red leather upholstery was put on the black seat box, black patent leather was installed on the dash and mud guard frames, and a whip was placed in the original whip holder. Today the restored vehicle is seen at Harriton House.

Mr. Gill is a master cabinetmaker as well as the administrator and curator of Historic Harriton House in Bryn Mawr, Pennsylvania and can be reached at 610-525-0201.



This 1890s road cart was completely restored and repainted in its original bright red and black paint and coated with gloss varnish by Bruce C. Gill of Bryn Mawr, Pennsylvania.

Historic Wallpaper Conservation Treatment

by Linda V. Ellsworth
Director, Conservation Center for Art
and Historic Artifacts
Philadelphia, Pennsylvania

Wallpaper is among the most ephemeral of the decorative wall treatments. It gradually deteriorates as it ages in the building in which it is hung. It is always vulnerable to dampness and also to any inappropriate cleaning that occurs, usually during redecoration. Regarded throughout much of its history as an inexpensive substitute for more luxurious materials like leather, tapestry, and fabrics, wallpaper has been preserved infrequently. Many mid-20th century restoration efforts replaced damaged historic wallpapers with either appropriate period papers or else with very faithful reproductions of the original. However, this approach is changing. More and more, house museums are opting to conserve original papers instead of replacing them.

Conservation of historic wallpaper employs many of the same tools and techniques used to treat other paper artifacts, but to do so is more complicated because of its typically vast surface area in association with an immobile substrate. Administrators and curators of historic houses are learning that a major wallpaper conservation project can be a very tedious and time consuming effort, so one should anticipate longer lead times along with substantial funding. Trained conservators today can now repair and stabilize old wallpaper with considerable success. The conservator's first priority is to stabilize the wallpaper. The second step is to complete aesthetic treatments including filling areas of loss with new compatible paper and carefully inpainted with appropriate materials in order to restore visual continuity.

Damage to wallpaper might be categorized into four principal areas.

- Staining or disfigurement from: water, grime, dirt, smoke and soot, applied surface coatings such as shellac, varnish or glue size, or overpainting from earlier and poorly executed restorations.
- Brittleness or acid induced deterioration caused by the composition of the paper, especially if the fiber content is wood or straw or if the sizing is an alum rosin.
- Deterioration of the painted design caused by abrasion from cleaning or from media degradation from excessive heat and/or humidity.
- Tears or distortions caused by structural shifting within the building that make plaster crack.

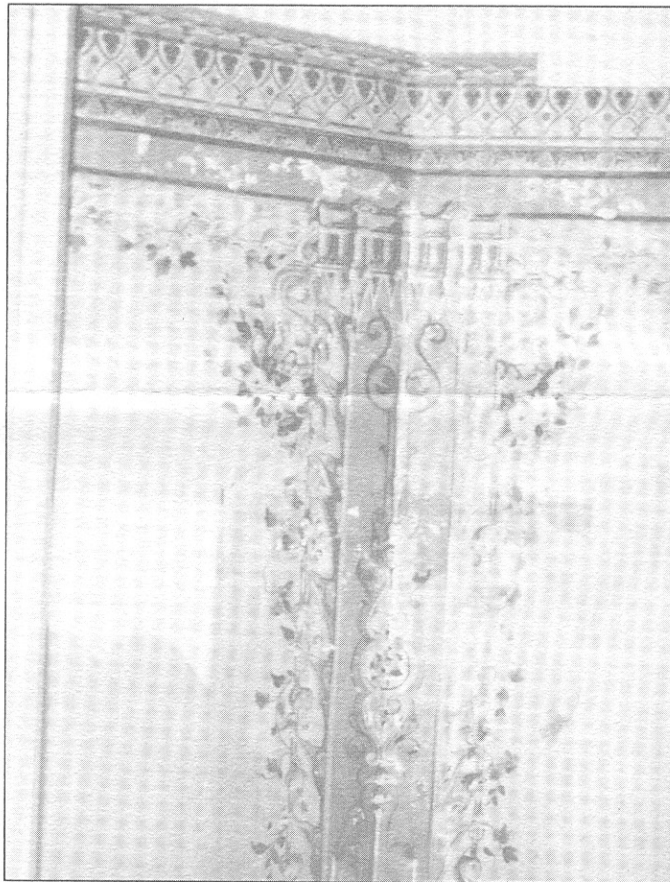
Most of the time in historic houses we see combinations of damage from all four categories.

For example, at the Octagon Room of Tyler Hall in Bucks County, Pennsylvania, the eighteenth century hand block printed French wallpaper had been damaged by fire, roof leaks, and exposure to direct sunlight as well as poor environmental conditions, including unusual fluctuations in humidity along with hot air vented directly onto it. In some areas sections of the paper were missing. In other areas, where a water leak caused damage, some of the paper and media on the surface were soft and pulpy and were covered with a powdery efflorescence. Other portions of the paper had become detached from the wall where the plaster underneath was cracked.

In treating this wallpaper, conservators from the Conservation Center for Art and Historic Artifacts (CCAHA) first cleaned the surface of the paper with soft brushes. The powdery paint layer was consolidated by spraying an acrylic resin onto it and the flaking paint was consolidated with a methylcellulose paste applied with a brush. Some detached areas of the wallpaper were removed so the plaster could be repaired. These sections of wallpaper were readhered with a mixture of methylcellulose and cooked wheat starch paste. In other areas of detachment the paper was not removed, it was simply lifted with a teflon spatula along existing cracks. The same paste was applied by brush

underneath the paper to readhere it to the wall. Care was taken to apply only a sufficient amount that would accomplish the task yet not stain the paper from excess water.

Areas of loss were filled with acid free paper that was similar in weight and texture to the original and toned to match the background of the original paper. In the final step, conservators completed limited inpainting to integrate the damaged areas into the overall design of the paper.



Octagon Room of Tyler Hall in Bucks County, PA.
19th c. French wallpaper exhibits degraded and damaged condition before conservation.

Ed. Note: Identification of the composition of the wallpapers can also be useful in the conservation process. Rag papers (made with a mixture of linen [flax] and cotton fibers) and wood pulp papers (made with either mechanically or chemically prepared hardwoods and softwoods) can easily be identified by the experienced microscopist using a polarized light microscope.

Planning your next paint analysis project? Don't forget the PAINTPAMPHLET™. This handy guide helps you take your own samples in step-by-step fashion. Then mail to us for lab analysis. Cost: \$5.

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The Frank S. Welsh Company specializes in microanalysis of old and modern coatings such as paints, varnishes, wallpapers, and fabrics on all substrates from buildings as well as from historic artifacts. The company analyzes and evaluates color and composition. We have performed coatings, pigment, fiber and media analyses along with color evaluations on hundreds of restoration/conservation projects across the U.S. and in foreign countries since 1974. Our experience in color services as well as our laboratory expertise using stereomicroscopy and polarized light microscopy can provide unequalled accuracy and results from coatings analysis.

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