Article: Treatment of a WPA era topographical map of the state of Louisiana
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Source: Objects Specialty Group Postprints, Volume Fourteen, 2007
Pages: 212-230
Compilers: Virginia Greene, Patricia Griffin, and Christine Del Re
www.conservation-us.org

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TREATMENT OF A WPA ERA TOPOGRAPHICAL MAP OF THE STATE OF LOUISIANA

Shelley Reisman Paine, James Bernstein, Richard Wolbers and Mary Zimmerman

Abstract

The conservation of a WPA era painted plaster topographical map was a very successful collaboration between the Louisiana State Exhibit Museum, conservators and student interns. The Museum was built in 1938 to showcase the products and industries of the State of Louisiana. The map was created c. 1939 by Duncan Ferguson, sculptor and Conrad Albrizio, painter. It is 14.3 meters (14 feet) in diameter and located in a 1.22 meters (4’) deep floor well in the atrium of the museum. It depicts Louisiana with each parish, parish seat, river, neighboring state and the Gulf of Mexico. Microscopic cross-sectional analysis revealed the surface was repainted approximately eight times covering the original muted surface with layers of glossy bright colors. Each successive repainting, colors, roads and icons representing Louisiana’s commerce were altered or relocated to update information. This fabricated surface turned the artwork from an artistic expression into educational tool.

The treatment project was organized as an advanced work-study project spanning two nine-week summer seasons. This approach permitted the conservators to research the artwork, train and supervise conservation graduate and pre-program students to master techniques to complete the treatment. Working as a team, each conservator and student worked “in one hand”, treating the map in such a way that it appeared as if only one person performed the treatment. This required intense training and collaboration. Further, the site precluded using a scaffold. This required the team to work directly on the map, and to develop specialized treatment materials and techniques to accommodate the site. The treatment removed multiple layers of garish overpaint, using solvent gels, followed by filing and inpainting to reveal the beautiful muted colors of the original presentation.

Introduction

The topographical map of the State of Louisiana is a New Deal era artwork created by Duncan Ferguson and painted by Conrad Albrizio in 1939 for the opening of the Louisiana State Exhibit Museum. The Museum was built in 1938 to showcase the products and industries of the State of Louisiana. It is 4.6 meters (15’) in diameter and located in a 1.22 meter (4’) deep floor well, surrounded by a railing, in the middle of the central atrium (Fig. 1). Visitors enter the building in front of the map and they became witnesses to the treatment of the artwork. Before treatment (Figs. 2, 3, 3) the map was a bright glossy didactic tool that had been updated periodically to represent the commerce of the state, while at the same time, disguising and altering the original artwork under layers of overpaint and varnish. After treatment (Fig. 5) the original soft matte surface was again on view.
Figure 1. Rail around topographical map in the atrium of the Louisiana State Exhibit Museum [1].

Figure 2. The topographical map before treatment covered in layers of overpaint and additional didactic design elements.
Figure 3. Madison Parish overpainted and covered with synthetic overlays and a plastic corn icon.

Figure 4. Iberia Parish with multiple generations of didactic icons.

Figure 5. The topographical map after treatment.
The treatment project was organized as an advanced work-study for nine conservation interns spanning two nine-week summer seasons. Mary Zimmerman, Museum Director was at the site at all times. A conservator, Shelley Reisman Paine, sculpture conservator and project Director, James Bernstein, painting conservator and mixed media, or Richard Wolbers, decorative surface conservator came to the Museum every other week and often together, to lecture, train, guide and supervise the work being performed by the students. They were also available for twice weekly conference calls and daily email updates. The conservation interns came from New York University and Queen’s University training programs, and pre-program students from Emory University’s Michael C. Carlos Museum. They included, Erin Falbaum, Jennifer Lis, Hillary Ellis, Dave Turnbull, Marie-Catherine Cyr, Emily Nomura and Kate Moomaw. Jennifer Lis returned the second season as site coordinator and Erin Falbaum as assistant site coordinator. In addition, throughout the project, to maintain continuity, each student had specific jobs in documentation and preparation of the materials being used. This level of organization allowed each student to focus on the treatment and not the availability of materials or the quality of their supplies. The diligent work of each collaborator permitted the project to be completed successfully.

**Project goals**

Five major goals were established to reveal the original artwork buried underneath layers of overpaint, varnish and decorative applications. The first and primary goal was to focus the team to work in “one hand” that is, treating the map in such a way that it appeared as if only one person performed the treatment. The second was to work slowly and watch for new information as the overpaint was removed. This methodical approach allowed Erin to find the first icon delicately painted on the artwork – a surprising and defining moment in the treatment. Third, to stop periodically throughout the project and document all surfaces insuring that no vital information was lost. Fourth, to be sure that everyone took breaks periodically to look at the entire map to evaluate and discuss the treatment, and to prevent fatigue and accidents in the well. Fifth, it was crucial that each team member ask any question at any time to fully understand any part of the project.

**Timeline and project requirements**

The treatment took three years to complete. In general, primary research and analysis was done during the year to prepare for treatment in the summer. During the first season, six layers of overpaint and varnish were carefully removed from the original surface, and areas of loss filled with Modostuc polyester putty. Six months later, during a site visit to the Museum, the map was sprayed with an isolation layer of varnish, and permitted to cure for six months until the next summer when the team inpainted the map and applied a final coat of varnish.

Technical studies were an integral part of the entire treatment. The project began with a review of the research on the map that had been carried out by the Director, and a thorough analysis of the paint film, using microscopic cross-sectional analysis and Fourier Transfer Infra-red spectroscopy, to identify the original presentation layer and later additions to the artwork.
Analysis continued throughout the project as new conditions were observed. Written documentation included a project summary and 56 individual conservation reports, each including analytical data, condition and treatment information along with extensive photographic documentation, for each parish and landform depicted on the map.

The site did not allow a scaffold to be used causing the team’s work to be done directly on the map. A minimum of four team members was in the well, with equipment, extraction systems and treatment materials, at any one time. Therefore, it was important to define safe, effective working conditions. The toxicity of all materials was reviewed to provide appropriate safety supplies and fume extraction at every work area.

The map is illuminated by daylight through full height atrium windows and 82 fluorescent ceiling lights. The ceiling lights included a variety of tubes providing a wide range of color. To limit the color temperature and provide a consistent and effective work and display lighting, the 82 fluorescent ceiling lights were replaced with tubes having a 92 Color Rendering Index and a color temperature of 5,100 degrees. For additional task lighting, full spectrum MR16 low-voltage halogen light fixtures, color temperature 4,700 degrees and 100 Color Rendering Index, were placed at each work area.

**Condition**

The plaster artwork was made in five sections: four parts attached to a central diamond, and is attached directly to the concrete foundation of the building. Separations were noted along each seam, probably due to settling of the foundation. The foundation was examined by an engineer and determined to be stable. The plaster was coherent; however, exposure to water from a Christmas tree displayed on the map, caused extensive damage to a 20.3 cm x 50.8cm (8”x20”) area of the map (see Fig. 6), coincidentally located in the Gulf of Mexico.

Fig. 6. Delamination of the plaster due to water damage.
The condition of the overpaint was carefully examined, tested and documented to understand its interaction with the original artwork underneath. It appeared that the overpaint and the original paint film have expanded and contracted at a different rates causing moderate delamination overall. Further, there are numerous minor and moderate areas of loss adjacent to the delaminations overall. Once the overpaint was removed, the original presentation pain layer was examined. This paint film was coherent and adherent to the plaster substrate. However, approximately a third of the paint layer was missing or abraded.

**Research and analysis**

The Director provided and dated two black and white reference images of the map. One, on the basis of the clothing worn by the people in the picture, was considered to be from the 1960s (Fig. 7). It displays a multi-colored painted surface, and a darker painted well surround. The second image (Fig. 8), considered to be from the 1940s on the basis of a notation on a library record, had a multi-colored painted surface and three-dimensional icons attached to the surface that reflected the commerce of that parish.

![Figure 7. This photographic image, assumed to be from the 1960s, does not show any three-dimensional icons (Louisiana State Exhibit Museum Library).](image-url)
Determining whether the map originally had icons, as well as answering other questions relating to the paint layers, was accomplished by using microscopic cross-sectional analysis and Fourier Transform Infra-red spectroscopy. Approximately 35 samples were analyzed using these techniques. For example, these analytical techniques determined that the well surround, that appeared a dark cranberry color (see Figs. 9, 10), was originally a warm gray. The original gray was matched to Munsell 4.5Y 6.3/2.2, L*a*b* L64.90 a-1.46 b16.40 using a Minolta CR-241 microscope colorimeter, with the closest commercial match to Benjamin Moore HC 98 Providence Tan, that was used to repaint the well surround.

Figure 9. Microscopic cross-section of the well surround in normal light at 125x (photograph by R. Wolbers).
The three-dimensional icons were also examined analytically. Analysis determined that the icons were created in at least three generations and most likely cast from similarly shaped icons. This information agreed with our observations and their relocation on the map confirmed by a reference image. Two generations of painted and overpainted icons are illustrated by comparing the cross-section of a pine tree icon (Fig. 11), showing an original green paint under a layer of overpaint, and an icon of corn with only one layer of green paint below a polyurethane coating. The green paint on the newer corn icon matches the overpaint in the second paint layer of the older tree icon.

A cross-section of the paint film before cleaning (Fig. 12) reveals 8 distinct layers. From the bottom, these are original glue-sized plaster, original green parish color, overpainted blue green,
overpainted purple, varnish layer, overpainted purple, polyurethane coating and a top layer of glue and soil. Stained cross-sections (Fig. 13) using TTC, ALEXFLUOR 488 and RHOB stains [2] indicate the location of glue, polyurethane, oil and natural resins. FTIR spectroscopy [3] of the sample (Fig. 14) confirmed polyurethane as the uppermost map coating, and the original paint film as an emulsion of linseed oil and casein paint.

Figure 12 (left). Cross-section of the paint film, normal light at 125x, with eight individual layers. Note the original glue-sized plaster and the original green paint covered by six layers of paint and varnish (photograph by R. Wolbers).

Figure 13 (right). Stained cross-sections of the paint film at 125x using TTC, ALEXA and RHOB stains (photographs by R. Wolbers).
Cleaning

The goal in cleaning was to safely remove the three oil-base overpaint layers and polyurethane coating to recover the casein/linseed oil original artwork. After training in the history of the artwork, cross-sectional analysis and gel chemistry, the overpaint was slowly removed with three different gels [4]. To minimize exposure to solvents and to better control the process. As the students worked with the gels, we discussed their approach and then as a team, modified their timing and application to achieve the appearance that one hand did the entire cleaning project. The sequence of gel use followed the progression of over-paint materials in terms of their peak solubility. The pyrrolidinone gel was used to remove the polyurethane; the acetone and subsequently the methanol gels were used to remove oil emulsion, and oil over-paints respectively. Scalpels and wood tools were also used to separate stubborn paint. However, if the original surface was in danger, or prone to softening or dissolution, the overpaint was left and would be minimized during inpainting (Fig. 15).

Early in the cleaning process, a painted icon of a pine tree on the original surface of the artwork was discovered. Samples were taken and (Fig. 16) and the analysis indicated that the painted icons were located between two layers of the original paint, the lowest being the original presentation surface of the map A dirt layer was noted over the icon, demonstrating that the icon was a presentation surface for some period of time until it was overpainted with original paint materials. The Director determined that painted icons were the original symbols of commerce. Why they were overpainted is not known. However, after extensive deliberation and examination of the cross-sections, the Director decided to archive the three-dimensional icons and reveal the painted icons.
Figure 15. Over half the overpaint has been removed.

Figure 16. Cross-section of the paint layer showing a painted icon in normal light at 125x (photograph by R. Wolbers). There is dirt on the surface of the paint, indicating that this was an original presentation surface.

**Varnishing**

During cleaning, the overpaint protected the artwork from direct contact by the team. However,
it was clear that for any further treatment, the team had to be separated from the map to prevent abrasion to the surface and heat transfer to treatment materials. Therefore, mats were made and tested to determine how to isolate the map from heat to insure that the team’s body temperature would not soften any treatment material used (Fig. 17).

Outlast Phase Change Material was tested. This fabric includes a phase change material that distributes and restricts heat. Therefore, a test mat was created by placing the Outlast fabric under a 3” block of Esterfoam that had a pocket for a data logger. The entire mat was then covered with a soft cotton fabric. As the students worked on the mats, the data logger measured the temperature at the map surface. Mervin Richards, conservator, National Gallery of Art, provided the data loggers and the test results. This information was used to choose the glass transition temperature of the isolation varnish and inpainting materials and to design the work mats to be used during inpainting. Tests revealed that the mats kept the surface of the map below 90 degrees F. Therefore, because Tg is an additive process, Golden MSA Varnish, Tg 101F and Golden MSA Hard Varnish, Tg 122F, blends of Rohm and Haas Acryloid B67, an isobutyl methacrylate polymer and F-10, butyl methacrylate, were mixed to achieve a Glass Transition Temperature (Tg) of approximately 110 degrees F.

The 2005 season ended with the map cleaned and all small areas of loss were filled with Modostuc White patching putty and the large area of loss in the Gulf of Mexico with plaster. Four months later, during a site visit, a thin, saturating, isolation layer of the varnish Golden MSA Gloss/Golden Hard MSA Gloss/Golden MSA Satin 5:1:1 in 5 parts VM & P Naphtha and a few ounces of xylene was applied with a HPLV spray gun fed with warmed compressed air (Fig. 18).
Inpainting

To prepare for inpainting, the colors of the mural were judged and the benefits and drawbacks of potential retouching systems were considered. A plastic, polymer medium was selected, as it would be likely to perform better over time in the Foyer setting than one of the lower molecular weight resin inpainting systems. Color swatches to match colors on the map were prepared using Golden MSA colors and Kremer powdered pigments. The range of pigments offered by Kremer proved essential to arrive at close matches of the mural palette. Study of the outdoor frescoes (also painted by Albrizio), with remarkably similar colors and tonal harmonies, confirmed the inpainting palette choices.

Inpainting in one hand, just as cleaning in one hand took training and collaboration to accomplish successfully. The team was given instruction in compensation theory and practice, in the form of Bernstein’s intensive ‘Mastering Inpainting’ workshop. This training included lectures, demonstrations and study of the Mastering Inpainting Workshop Manual (Bernstein and Evans 2008). The training continued with preparation of new sample color reference boards, resin and solvent mixtures and development of painting techniques. A formidable issue in this stage of the treatment was the horizontal orientation and smooth, non-porous character of the mural surface. These characteristics meant fighting gravity and the inevitable running of color off the brushes upon contact with the map. To counter these concerns, a relatively fast evaporating solvent mix and small brush sizes (Winsor Newton series 7 sable #’s 1, 0 and 00) were selected, permitting rapid application of the paint as dots and strokes.

The inpainting process included multiple layers of paint. All areas of the mural were brought up with initial toning that was slightly lighter in value than the desired final tone. This enabled
perception of color, value and image gradations that were not possible due to the extensive interruptions of image, including areas of abrasion, damage and white fills. Further, working as lean as possible, and loading proprietary colors, when used, with more pigment, guaranteed effective coverage in the early stages of inpainting. Color, value and sheen were then built up and corrected with successively richer paint applications. Each area of loss required from 3 or 4 applications of paint, moving from a lighter-toned, pigment-rich paint, continuing with increasing amounts of medium in glazes until the desired gloss and color was achieved (Figs. 19-22).

The inpainting medium was a 4:1 blend of Golden MSA Gloss Varnish, a blend of Rohm & Haas B-67 (an isobutyl methacrylate) and F-10 (an n-butyl methacrylate), and an additional amount F10. The Golden varnish includes Paraloid B67 (Rohm & Haas) which helped raise the Tg and hardness of the retouches, and includes small amounts of Benzotriazole and Tinuvin 292 HALS providing some ultraviolet light protection. The map was retouched with color mixtures from 43 dry pigments dispersed in this medium, supplemented by 18 colors from the available Golden MSA Colors.

The final steps of inpainting were the reconstruction of the painted icons, map and road features, and lettering. Golden Fluid Matte Acrylics, pigments and a few drops of Liquitex Acrylic Airbrush Medium were used for the roads and letters. These details were inpainted with an aqueous acrylic dispersion retouching system, different from the solvent-based one selected for the field colors. This enabled the fluid painting of fine detail work on top of the Paraloid compensation without lifting or altering the underlying work. Further, if a feature did not go on exactly as desired, it could be removed promptly and safely with water, and then redrawn. When inpainting was completed, every pigment and material used in compensation on the map was documented in each parish report for future reference.

Figure 19. Assumption Parish before treatment.
Figure 20. Assumption Parish after cleaning. A painted sugar cane icon is visible on the right.

Figure 21. Assumption Parish after inpainting, with a detail of the sugar cane icon on the right.
Most students are not asked to painstakingly clean overpaint or inpaint every day for nine weeks. The hands-on experience of inpainting the map reinforced their training. The students who were part of this project were given an invaluable learning opportunity and they rose to the occasion, mastering the subtleties and nuances of these techniques. At the end of the project they were asked to list their ten most important issues for inpainting. Each list included the essential ingredients for successful compensation, and are consolidated below:

1. A bad fill cannot be inpainted correctly. It is critical to prepare fills correctly honing them to perfection under raking light.

2. Understand the properties of your materials and customize them before you start each project.

3. Use the best quality brushes, colors, media and diluents. Know the properties of each pigment and use as few as possible to achieve the desired color. Mix diluents each day to insure the proportions remain correct, replacing working solutions often to avoid color contamination.

4. Prepare color and paint-binder reference sample boards, painting colors and coatings all the way out to the edge of the boards.

5. Work in thin layers starting with a lean, lighter-in-value color, building image and gloss gradually in successive glazes.

6. Be aware of the artwork at all times. Step back from the work regularly to read the appearance of colors and transitions from viewing level.

7. Work with generous amounts of uniform and correctly color-balanced light.

8. Be aware of ambient temperature and humidity to adjusting paints, varnish and diluents accordingly. Also, use clean diluents for inpainting to avoid contamination.

9. Pay attention to and retain the appearance of paint character and age.

10. Be aware of occupational safety. Contain colors and fluids against spills, provide adequate ventilation, wear solvent and particle respirators, manage waste disposal and take breaks often.

**Final varnish**

A thin coating of a harder-than-usual painting varnish was selected for an overall seal. This was done as a precautionary measure, due to concern for the horizontal orientation of the surface, the tendency for convection currents to deposit airborne matter into the sunken well, and for durability, knowing that regular dusting and maintenance of the map would be required in the future. A final varnish was a 6:1:1 blend of Golden MSA Hard Gloss Varnish Golden MSA Hard Satin Varnish and Golden MSA Satin Varnish in 5 parts VM & P Naphtha and a few ounces of xylene. This mix was applied using a HPLV spray gun fed by warmed compressed...
air. This produced a beautiful, lustrous, pearly finish that maintained color clarity while bringing down sheen and not introducing an undesirably toothy, dust-collecting surface.

Conclusion

The success of the project was due to intensive planning, training, oversight and a true spirit of dedication and collaboration. The conservators continually researched and re-evaluated every component of the project to insure that appropriate methods and materials were used. The finest materials were provided and techniques were customized to allow the team to focus on technique and to work with one hand. However, it was the perseverance and camaraderie of the students, as they worked in stressful and difficult physical conditions, which allowed the project to be done timely and successfully.

Acknowledgments

The conservators wish to thank the students for their accomplishment in being the hands of the project, and the staff at the Louisiana State Exhibit Museum for their support. And, a special thank you to Nederman & Co. for their generous donation of much of the ventilation equipment and to Mervin Richards for his help with the data loggers.

Endnotes

1. Editor's note: All uncredited photographs were taken by Dave Turnbull, Erin Falbaum or Shelley Paine. The authors were unable to provide more specific information.

2. Acronyms: RHOB (Rhodamine B Sigma-Aldrich Cat No R4252, a general lipid soluble fluorescent dye). TTC (Triphenyl Tetrazolium Chloride, Sigma-Aldrich Cat No. T8877, as general redox sensitive dye which can be used to indicate reducing sugar moieties), and Alexafluor 488 (Invitrogen, Eugene OR, a proprietary fluorescent dye, as a succinimidyl ester, which can covalently react with free amino groups on proteins) (see Wolbers 2000; 167-182).

3. Equipment: Thermo Nicolet IR100 FTIR, Thunderdome ATR Cell Run Conditions: Resolution 4 cm-1; Transmission Mode; Gain 4; No of Scans = 32. Software: EZ OMNIC, proprietary Thermo Nicolet software used for conversion to absorbance mode; baseline smoothing and corrections; peak assignments; library searches, spectral subtraction, and interpretation. Libraries: Hummel Polymer Library; User Defined Library; IRUG Artist materials (see Wolbers 2000).

4. 1-Methyl-2 Pyrrolidinone gel:
   100ml solvent (Southern Scientific)
   20ml Ethomeen C-25 (Talas, NYC)
   2g Carbopol 954 (Talas, NYC)
   7ml de-ionized water

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Acetone Gel:
- 100ml solvent (Home Depot)
- 20ml Ethomeen C-25 (Talas, NYC)
- 2g Carbopol 954 (Talas, NYC)
- 10 ml de-ionized water

Methanol gel:
- 100ml solvent (Home Depot)
- 20ml Ethomeen C-25 (Talas, NYC)
- 2g Carbopol 954 (Talas, NYC)
- 10 ml de-ionized water

References


Suppliers

Ethomeen C-25, Carbopol 954:
Talas, 20 West 20th Street, New York, New York 10011

Esterfoam:
Ashley Distributors, 5722 W. Jefferson Blvd., Los Angeles, CA 90016-3107

Nederman extraction units:
Nederman, Inc., 39115 Warren Road, Westland, MI 48185

Methyl pyrrolidinone, N-Methyl pyrrolidinone:
Southern Scientific, P.O. Box 150176, Nashville, TN 37215, 615-665-4400
(Kathleen@southernsci.com)

Modostuc White: a proprietary wall filling putty manufactured by Plasveroi International, Via Camussone 38 Frazione Giovenzano, Vallezzo Bellini, Italy. Tel 0382 926 895 Based upon calcium carbonate with a polyvinylacetate dispersion binder, said to contain amounts of Barium Sulfate, Kaolin and almond oil (preservative). Plasveroi@iol.it; available through:
Peregrine Brushes and Tools, 1211 North 60 West, Wellsville, UT 84339-0200, 888-389-5222 www.brushesandtools.com

Outlast Phase Change Material
www.outlast.com
Pigments:
Sinopia Pigments and Materials, 321 7th Street, San Francisco, CA (415) 824-3180
www.sinopia.com
Kremer Pigments, 247 W. 29th Street, New York, New York, 10001 (212) 219-2394
www.sinopia.com/kremer.html

Winsor Newton Series 7 sable watercolor brushes:
Available from art supply sources (including www.MisterArt.com)

Golden Artist Color Products:
Golden MSA Conservation Colors (pigments in Rohm & Haas butyl methacrylate Paraloid F10)
Golden Matte Fluid Acrylics.
Golden MSA Varnish (Gloss and Satin); Golden Hard MSA Varnish (Gloss and Satin);
Available from Golden Artists Colors, 188 Bell Road, New Berlin, NY 13411. Tel. (800) 959-6543. www.goldenartistcolors.com

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