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Wooden Artifacts Group Postprints

Presentations from the 2010 AIC Annual Meeting in Milwaukee, Wisconsin
Wooden Artifacts Group Sessions

Wooden Artifacts Group

Postprints of the Wooden Artifacts Group Session

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POSTPRINTS OF THE WOODEN ARTIFACTS GROUP SESSION
ANNUAL MEETING

2010 WAG INDEX

2010 WAG ABSTRACTS (WRITTEN PAPER NOT SUBMITTED)

LAUREN PAIGE ISAACS

Adhesion Coercion: An Investigation into Potential Coatings for PEG-Treated Wood

ABSTRACT—The author explores potential coatings for PEG-treated wood, similar to the problems faced in Ed Moulthrop's work. Mock-ups of PEG-impregnated wood, simulating Moulthrop's documented materials and technique, were created and coated with a selection of traditional and synthetic conservation materials to achieve an acceptable finish. The final results of testing were not as initially predicted, and ultimately served to demonstrate the underlying contingencies affecting long term adhesion to PEG surfaces including molecular weight, solubility, surface energy, relative humidity, and reaction kinetics. This paper aims to highlight these fundamental aspects of adhesion, and offer suggestions for future replacement coatings.

1. INTRODUCTION

There has already been a significant amount of information collected in regards to Edward (Ed) Moulthrop's (May 22, 1916–September 24, 2003) green wood turning technique (Nish 1983), as well as the consequential adhesion problems (Pine 2006) associated with his choice of materials. While Moulthrop was aware of the adhesion problems associated with his bowls, he regularly agreed to refinish failed coatings using virtually the same materials as those implemented at the time of production. Ed Moulthrop passed away on September 30, 2003, eliminating any future possibility of refinishing the coatings by the original artist as a treatment option. Moulthrop's sons, however, continued to carry out their father's legacy of turning bowls and refinishing failed coatings associated with their father's work. There are ethical implications associated with having a practicing artist refinish the original coating of a deceased artist, even if that artist is of direct training and lineage to the deceased, as is the case with Ed Moulthrop's sons. Given that the delamination problems of Moulthrop's work are now beginning to be observed in both public and private collections, it makes sense to reinvestigate potential conservation solutions to the adhesion problem associated with these popular turnings.

2. METHODOLOGY

To better understand the inherent factors influencing treatment options, mock-ups of polyethylene glycol(PEG)–impregnated surface were created from readily available birch wood, which is similar in cellular structure and color to the tulip wood used by Moulthrop on his bowls. Given the multitude of intrinsic factors associated with the creation of this particular bowl, it must be stressed that it is virtually impossible to recreate of the exact conditions as those present at the time of this bowl's production; however, for the focus of this investigation, the aim was merely to create a wooden surface, similar to tulip wood, saturated with PEG to evaluate the effectiveness of various coatings.

Two dimensional mock-ups were created from non-sterile birch tongue depressors. The depressors were initially submerged in a ceramic vat of tap water overnight to encourage the intracellular uptake of water. It is worth pointing out that Moulthrop used *green* wood, which has both bound and free water that factors into its overall moisture content (MC). The birchwood on the other hand, was only able to take up free water because it had already been preshrunk before impregnation; however PEG depends on diffusion through free water in the cell cavities to reach the cell wall. This is also why waterlogged wood can effectively be stabilized with PEG. They were then placed in a 50% (w/v) aqueous solution of PEG-1500 at 140°F for 36 h, replacing both the water and absorbed PEG components intermittently as needed (Hoadley). The sticks were then allowed to dry in ambient laboratory conditions for 24 h, and excess PEG was wiped from the surface with a cotton cloth (fig. 1a). A range of possible coatings were selected for testing including both traditional wood coatings, as well as known conservation coatings/varnishes. These selected coating were applied to prepared tongue depressors as described, then subjectively evaluated on the basis of appearance and ease of application following the noted cure/drying time. On the basis of these findings (table 1), probable coating was selected for additional three-dimensional application testing.

Solid 3-in. diameter birch wood balls were prepared with PEG similarly to the two-dimensional versions, with the exception of being left in the PEG for 172 h, rather than the initial 36 h to compensate for a greater wall thickness during penetration (fig. 1b). The balls were initially coated by a 1-in. flat natural bristle brush with a diluted coating while spinning on a power drill, mimicking Moulthrop's lathe application technique. This

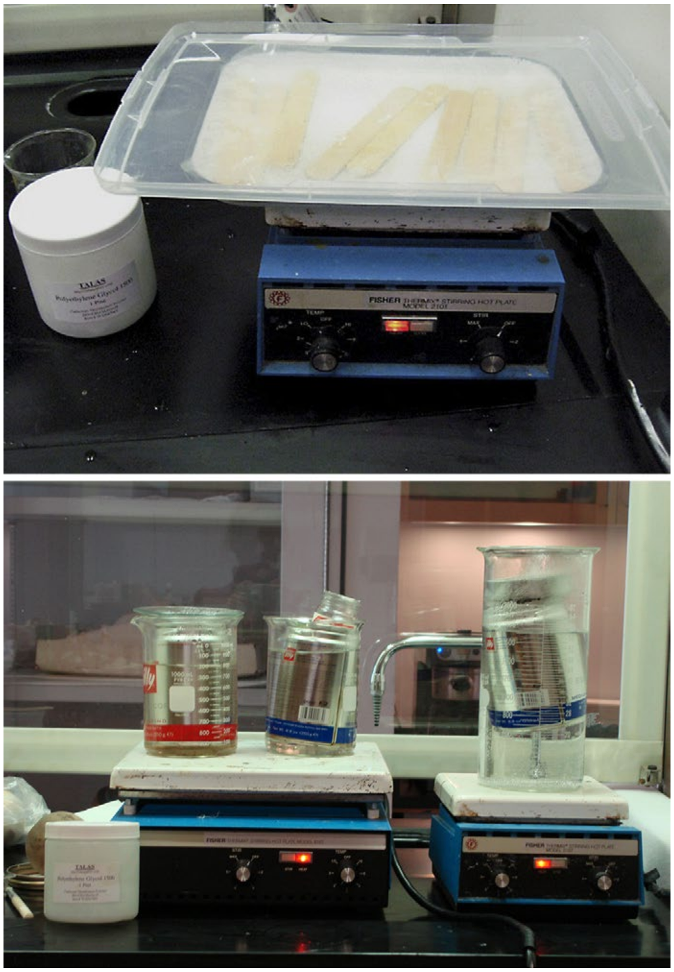

Fig. 1. (a) PEG impregnation of 2D tongue depressors (b) 3D balls in preparation for coating application

Fig. 2. Visual appearance of 2D mock-ups

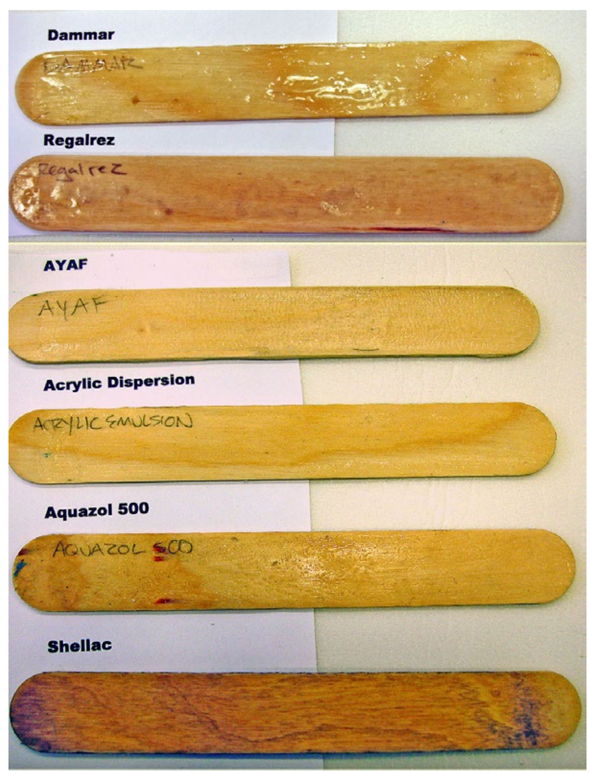

Fig. 3. Visual appearance of 2D mock-ups continued

application technique failed to dry evenly across the surface prompting further investigation into the dynamics of PEG as a material. The search for a successful coating procedure would be investigated.

3. FINDINGS

See table 1 and figures 2–4a,b.

4. INTERPRETATION AND DISCUSSION

Of the coatings tested, the most acceptable visual results were achieved on two dimensional surfaces with Paraloid B-72 in xylene, B-67 in V&P Naptha, Golden MSA varnish in V&P Naptha, oil-based polyurethane, and the two-part aromatic epoxy (Epotek OG205). The results of the other tested coatings including shellac in ethanol, water-based polyurethane, Regalrez 1049 in Shellsol 340HT, Dammar in xylene, and a two-part aromatic epoxy (Epotek 301) were not acceptable for reasons listed in the results section. Considering the range of chemistries

Table 1. Results of Testing of Coating on 2D Birch Tongue Depressors, Impregnated PEG 1500

Coating Tested	Application Mode	Number of Coats/Set Time	Findings	Notes
Shellac (in ethanol)	Dabbed with cloth	aprox 15, dried overnight	could not get it to build up proper thickness of coating	ethanol can leech out PEG with long set time
Epotek 301	Brush and sand	2, 24 Hr cure	best sheen, easiest application, not as much finishing	3D testing with an aliphatic based catalyst that reacts faster
Polyurethane (oil based)	Brush and sand	4, 24 Hr cure	good sheen, yellower already	will continue to yellow altering appearance
Polyurethane (water based emulsion)	Brush and sand	4, 24 Hr cure	good leveling and proper sheen, but pinholes with drying	water and ethanol base will interact with PEG in wood
Acryloid B-72 (~20% xylenes)	Brush and sand	3, dry in 2 days	good leveling and proper sheen	Would recommend, but Tg is too low to consider
B-67 (~20% in V&P naptha)	Brush and sand	3, dry in 2 days	good leveling and proper sheen	Would recommend, but has been known to age poorly, and one of the reasons MSA varnish was created
Regalrez® 1094 (10% in Shellsol 340HT)	Brush and sand	2 > week to dry	too shiny, thin, hard to layer, too sticky to sand	not an option
Golden® MSA (thinned in V&P naptha)	Brush and sand	3, 3 days to dry hard	good leveling and proper sheen	3D testing
Dammar (20% in xylenes)	Brush	2, > week to dry	too shiny, thin, hard to layer, too sticky to sand	Not an option

Others tried, but abandoned early.
Aquazol 500 (in water)
Liquitex Acrylic Emulsion Varnish (gloss)
PVA: AYAF (in ethanol)

Fig. 4. (a) Visual appearance of 3D PEG 1500–impregnated birch balls with epoxy and Golden MSA–based coatings (b) Visual comparison of mock-up versus original coating on a privately owned bowl Moulthrop tulipwood bowl

involved with each of the coatings tested, the resultant discrepancies puzzling; however, with a bit of investigation into the chemical and physical properties associated with each of these coatings at the interface of a PEG-treated surface, a better understanding of the specific problems associated applying coatings on these dynamic objects can be achieved and used in developing an effective treatment protocol.

4.1 SOLUBILITY AND MOLECULAR WEIGHT

One of the most important factors to consider is the solubility of PEG. The solubility of a polymer can be predicted by knowing and plotting the Hildebrand solubility parameter on a Teas chart. Figure 5 demonstrates that PEG is soluble in water and insoluble in both aromatic and aliphatic hydrocarbons as well as alcohols; however, the results of the Aquazol 500 and shellac tests indicate that PEG was in fact interacting with and disrupting the formation of a film coating. One possible explanation of this contradictory behavior is based on the molecular weight of

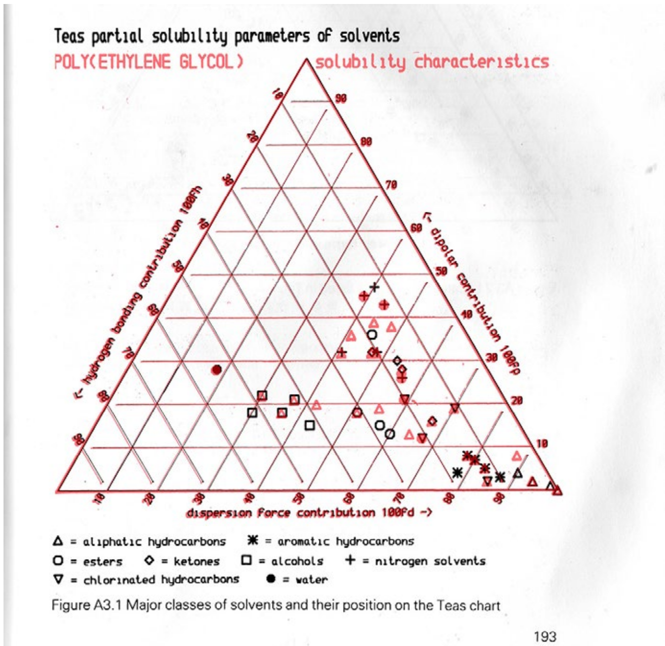

Fig. 5. Teas chart from "Horie" plotting the Hildebrand solubility parameters of PEG 3350 (in red) overlaid with the Hildebrand solubility parameters (black) of specific solvents illustrated (handwritten notes).

PEG represented on the Teas chart, the PEG used for testing, and the PEG employed by Moulthrop.

According to the Teas chart in figure 5, the solubility of PEG was based on a molecular weight of 3350, *PEG 3350 from Union Carbide*. The PEG obtained for testing was *PEG 1500 from Union Carbide*, under half of the molecular weight that this chart is based on. As molecular weight of a polymer decreases, the length of the polymer chains correspondingly decreases, allowing for greater solvent interaction with the substrate, thus increasing a solubility of the given polymer. PEG has a wide variety of industrial uses, and it has been modified to accommodate specific purposes.

Moulthrop reported using an even lower molecular weight of PEG, PEG 1000 (Nish 1993), than that which was tested to treat his wood; however this "1000" denomination of molecular weight is a bit misleading. As mentioned by Dave Grattan in a personal e-mail correspondence, at the time of Moulthrop's activity, PEG was sold commercially as a blend of various molecular weights that were then averaged together to come up with a final numerical denomination. PEG blends are based on an average molecular weight, as opposed to the pure PEG 1500 used for testing, and the PEG 3350 that is the basis of the Teas chart. If Moulthrop's PEG 1000 was actually a blend of varying molecular weights, any use of a polar solvent delivery system such as alcohols or aromatic hydrocarbons, could still run the risk of interacting with smaller molecules of PEG, disrupting the appearance of a final coating; therefore,the following tested coatings—acrylic dispersion varnish, water based polyurethane, shellac, Aquazol 500, and AYAF—were unsuccessful. These coatings were not able to adequately cover the PEG-treated wood due to the similar solubilities of PEG and the solvent delivery systems of these resins.

However, if based off of solubility alone, the unsuccessful Dammar and Regalrez 1094 varnishes tested should have been successful since they were delivered in xylene and Shellsol 340HT solvents, respectively. In fact, the Paraloid B-72 in xylene as well as the Paraloid B-67 and Golden MSA in V&P Naptha were successful when delivered in comparable solvent systems. Consequently the problem with Dammar and Regalrez 1094 exist in the resins, not the solvents they are delivered in.

One of the main similarities between Dammar and Regalrez 1094 is their low molecular weight. Both resins were selected for their success when used as varnishes on oil paintings. The low molecular weight combined with the slowed evaporation rate of hydrocarbons permits a smooth leveled film formation with high gloss retention (Whitten 1997). However, when considering the given situation of coating a PEG-infused surface, the low molecular weight becomes problematic. According to diffusion theory (fig. 6), "polymers in contact may interdiffuse, so that the initial boundary [interface between coating and substrate] is eventually removed" (Comyn 1997, 10). Given this information, combined with difference in molecular weight between the PEG and the tested coatings, low-molecular-weight resins, or at least those similar to or less than the given PEG given substrate should be ruled out as potential coatings. This not only includes Dammar and Regalrez 1094, but other low-molecular-weight resins such as: mastic, Laropol K80, Acron P-90, and other resins between 500 and 1000 (de la Rie 1987).

Polymeric resins, those with average molecular weights ranging from 10,000 to 500,000(de la Rie 1987), were more successful as coatings because of their ability to prevent diffusion of the PEG through the coating. Additionally, there is a direct relationship between an increase in molecular weight and an increase in viscosity of the polymer in solution. While this increase in viscosity is undesired for picture varnishes on two-dimensional objects, it becomes essential in adequately coating a three-dimensional object with an irregular surface.

4.2 SURFACE ADHESION

The irregularity of Moulthrop's surfaces present many obstacles for achieving an evenly coated surface. When turning and finishing green wood on a lathe, Moulthrop imparted fine striations on the wooden surface of his bowl, ultimately increasing the surface area for adhesion of a coating; however, as PEG is inevitably exuded from the wood in a given environment, it collects within these small recesses preventing an applied coating from forming close associations with the wood.

Forces of attraction need close proximity to bond, but the voids present in wood make adhesion difficult. PEG is classified

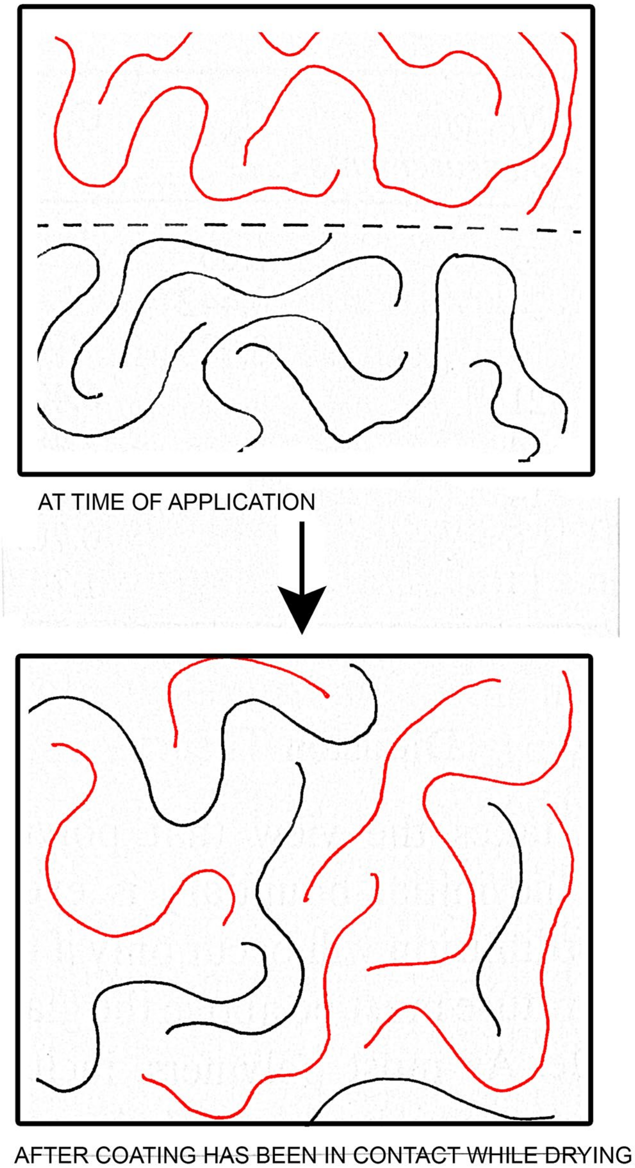

Fig. 6. An adapted schematic from Comyn (p. 10) illustrating diffusion of PEG (black) within the network of low molecular weight resins (red) like Dammar and Regalrez 1040

as a polyolefin, meaning that it has a high surface tension a low wettability (fig. 7) (Comyn 1997, 12). To adhere well, the coating must penetrate the wood grain to some degree wet the surface evenly. In finishing techniques, this is typically why the first coat saturates the surface, is sanded back, and then additional coatings are reapplied. In this case, the exuded PEG ultimately creates weak boundary interface overall, which does not allow for mechanical interlocking of the coating with the wood surface below preventing proper adhesion. To overcome this problem, the PEG must be reduced at the surface of the wood, and remain that way during coating.

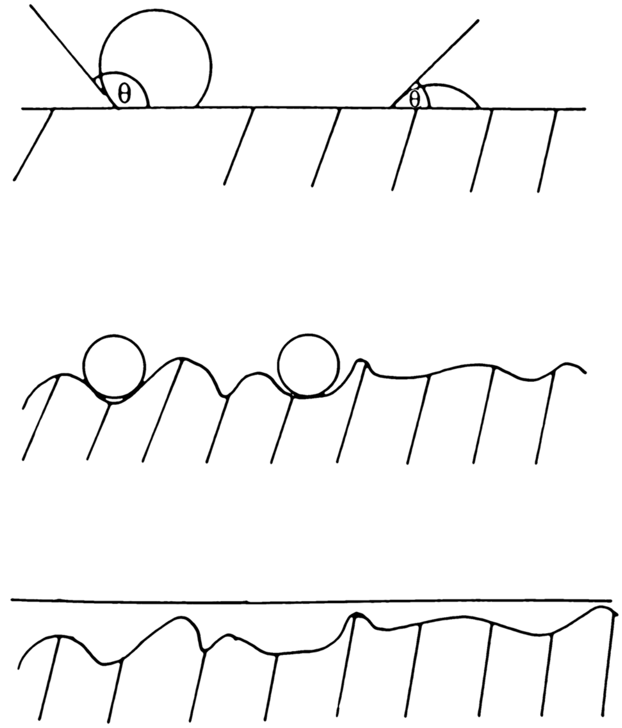

Fig. 7. An illustration from Comyn (p. 3). Liquid droplets making both high and low contact angles on a flat solid surface, (center) PEG accumulating in fine recesses of wood surface preventing contact with the wood, (bottom) good leveling with a high contact angle on a wettable surface.

5. CONCLUSIONS

Given the success of the high-molecular-weight resins applied in low-aromatic solvents like Paraloid B-72 in xylene, Paraloid B-67 in V&P Naptha, and Golden MSA varnish in V&P Naptha, it becomes clear that higher-viscosity coatings in a slow-evaporating nonpolar system are the best options for recoating a given object. When considering which of these successful coatings in testing is best for long-term use, B-72 can be ruled out due to its low glass transition temperature that ultimately will scratch and attract of dust and debris if conditions vary. Paraloid B-67 on the other hand has a higher glass transition temperature, which avoids many of the problems associated with B-72; however, B-67 has been documented as having poor aging characteristics, becoming gray and less reversible overtime. For this reason, it appears that Golden MSA varnish is the best option for coating in this case from those resins tested. While there were favorable results obtained with both the aliphatic epoxy (Epotek OG205) and the traditional oil-derived polyurethane, both coatings are not reversible and these polymers have been known to yellow over time and are not easily reversible.

In this case, Golden MSA is the ideal coating for a cleaned surface PEG-free wooden surface. Golden MSA is a proprietary mixture of methylmethacrylate and n-butyl methacrylate acrylic polymers soluble in non-polar solvents with an added UV Light

Stabilizer to avoid some of the problems associated with the aging of B-67. The coating's permeability to water vapor, which is lower than that of acrylics, will allow the PEG-treated wood to change dimensionally with fluctuations in temperature and relative humidity while still remaining in intimate contact with the coating. Golden MSA varnish has a glass transition temperature higher than that of B-72, and the hardness is listed by Golden as similar to an HB pencil. Although this is still not as hard of a surface as desirable for long-term wear, Golden has recently offered a "hard MSA" version with a higher percentage of n-butyl methacrylate added to increase the glass transition temperature of the coating, which would still need to be tested in application.

6. TREATMENT RECOMENDATIONS

This paper referenced Ed Moulthrop's work as an example of the need to investigate potential coatings to use on PEG treated wood, but it does not recommend a specific treatment for Moulthrop's work by a conservator, or anyone else for that matter. Other factors must be considered in developing a proposal per a given object that go beyond the controlled testing of the prepared surfaces presented here.

6.1 OBJECT- AND SITE-SPECIFIC FACTORS

1. The unknown factors of the type of PEG used by Moulthrop at the time of production as well as any other staining process he may have employed per a given bowl
2. The equilibrium moisture content of the uncoated PEG-treated wood in a given treatment environment
3. The long-term display and storage conditions of the object following treatment

6.2 CONSERVATOR- AND TECHNIQUE-SPECIFIC FACTORS

1. The practical removal of the existing coating, without damaging the fine striations indicative of Moulthrop's turning, or reducing the saturation of the wood's coloring from his staining/choice of a given coating
2. How to concurrently preserve the signature and often accompanying inscription on the base of the bowl while removing and recoating
3. How to reduce the residual PEG in the uneven surface of the wood to promote the mechanical interlocking needed for and applied coating to be successful and how to maintain it before recoating

These factors have been considered by the author, and a preliminary proposal for treating Moulthrop's work has been developed; however, no further testing was performed at the time of publication, so it is not discussed here. If you are interested in further information or collaboration regarding this topic, please contact the author at the information provided through the AIC Membership Directory.

AKNOWLEDGMENTS

The author would like to thank the Art Conservation Department at Buffalo State College, the Kress Foundation, and the Museum of Modern Art for supporting this research. This research would not have been possible without the previous ground work done by Steven Pine of the Museum of Fine Art Houston on Moulthrop, and Dave Grattan of the Canadian Conservation Institute on PEG and Wood. A very special thank-you to the guidance of Conservators Roger Griffith of the Museum of Modern Art and Catherine Williams of Silver Linings Conservation, LLC.

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Whitten, J. 1997. Introduction: general characteristics of low molecular weight resins for picture varnishes. *Paintings Conservation Catalog, Varnishes and Surface Coatings.* American Institute of Conservation, Paintings Specialty Group. 53.

SOURCES OF MATERIALS

Non-Sterile Birch Tongue Depressors (Catalog no. 11-3000-555)
Fisher Scientific
755 US-202,
Bridgewater, NJ 08807
908-231-1306
www.thermofisher.com/

Aqueous Solution of PEG-1500
Union Carbide
Talas
30 Morgan Ave,
Brooklyn, NY 11211
212-219-0770; 212-219-0735
www.talasonline.com

Solid 3-in. Diameter Birch Wood Balls (Part# 9941K33)
McMaster Carr
600 N County Line Rd.
Elmhurst, IL 60126-2034
630-833-0300; 630-600-3600
http://www.mcmaster.com

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2010 WAG Abstracts

2010 WAG SESSION

The 1855 Restoration of a 16th Century French *Dressoir*

Joseph Godla, Conservator, The Frick Collection

A craftsman working in Marseille, France, in 1855 left a trade card and a note attached to a sixteenth-century French walnut *Dressoir*, now at The Frick Collection in New York. The note briefly describes the condition in which the object was found, mentions the name of the restorer, Frédéric Aupetitalot, *menuisier-ébéniste* in Marseille, and the fact that the piece was 350 years old at the time of the restoration. While the estimate of age may have been overly generous by approximately 60 years, the document serves as a rare record of an early treatment to an important example of French furniture from the late Renaissance.

The *Dressoir*, an elaborate cabinet on stand with boldly carved harpy supports, passed through several important French collections in the nineteenth century, including the celebrated Chabrière-Arles Collection of Lyon and Paris. The form and carving of the piece are related to sixteenth-century prints by the French architect and designer Jacques I Androuet du Cerceau (1510–1584). The piece was widely recognized in the nineteenth century as it was exhibited and published several times during the last quarter of the century, and it seems to have served as a model for reproductions made at this time. In 1916 it was purchased by the international art dealer Joseph Duveen and immediately sold to Henry Clay Frick.

Careful examination and documentation of the object indicates that Frédéric Aupetitalot took a conservative approach to some aspects of this restoration. This paper will discuss the 1855 restoration and compare it with today's standards of conservation. It will also look at published material related to the level of restoration and the desired aesthetic of collectors of the nineteenth century. The author will consider the degree of intervention in this restoration work, which was carried out by a French craftsman for a local collector. It will be compared with work carried out a few decades later in a prominent workshop in Florence by Stefano Bardini and Elia Volpi who were noted restorers of paintings but were also involved in treating Renaissance furniture bound for the American market. Several pieces that passed through their workshop are now in The Frick Collection, allowing for an interesting comparison.

The Treatment of a Carved and Painted Buffet by Paul Gauguin and Emile Bernard

Julie Simek, Associate Paintings Conservator, Kuniej Berry Associates

From August through October 1888, Paul Gauguin and Emile Bernard worked together in the small village of Pont Aven in Brittany, France. Even though they only spent three months together, this intense period of collaboration proved to be a defining moment in both their careers as they exerted a profound influence on each other in terms of subject matter, style, and technique.

One of the most intriguing outcomes of this period is a unique wood buffet decorated by both artists with carved and painted scenes that captured the "primitive" or "savage" quality that artists working in Brittany were seeking. This presentation will explore the tangible results of their close working relationship and place the buffet in an art historical context before focusing on the treatment of this complex piece. Over the years the paint layers have experienced severe cleavage and paint loss and the surface was coated with multiple layers of disfiguring coatings. One of the major issues encountered was the buffet's history and construction, specifically the question of what was original and what was alteration. It took a team of paintings, objects and furniture conservators, conservation scientists, and curators to bring about the exciting transformation of the buffet from an object of literal obscurity to a major, exhibitable artwork.

Survival of the Great Fire of London: Sir Paul Pindar's house façade of 1600–Conservation and re-display

Carola Schueller, Furniture Conservator, Victoria & Albert Museum, England

The façade of the two story house was built in approximately 1600 and originally part of Sir Paul Pindar's house on Bishopsgate, London. This exquisite piece of early architectural woodwork is one of only a few wooden buildings to have survived the Great Fire in 1666. It had been on display at the Victoria and Albert Museum for nearly 100 years. In 2006 it was dismantled into its individual structural components in preparation for re-display in the new Medieval and Renaissance galleries, open to the public in November 2009. Before conservation a comprehensive survey recorded the original structure, pegs, metal fittings and assembly marks. It also identified replacement parts and remains of paint. Built of oak, the facade is constructed of timber frames with mortise and tenon joints. The outer panels are decorated with carved scrolled strapwork whereas the panel-and-frame work on the inside is plain. Detailed technical drawings of joints were made to illustrate the basic construction. The proposed display was designed to incorporate a supportive steel structure at each floor level replacing 19th century additions. Therefore the conservation treatment concentrated on stabilizing the individual parts. Once dismantled the house front components underwent a condition assessment for the first time and subsequent conservation treatment. The damage types included severely weathered and degraded wood, heavy soiling and loss of joint components. This paper will concentrate on the approach chosen for loss compensation. Since losses at joints gave access to construction and manufacturing details of tenons and mortises that are usually hidden the premise for replacements was to keep the original joints accessible. While replacements are traditionally glued to the original, in this case they were designed to be non-intrusive and physically detachable where possible. Oak strips were shaped to fit the area of loss in layers. Additionally epoxy putty was used with a barrier layer between the new and the original wood to help achieve a flush finish. Replacement wood was not inpainted to distinguish between original material and conservation addition. A time lapse camera will document the installation work.

A Conservation Collaboration: The James Monroe Gilded Ceremonial Armchair

Rick Vogt, Conservator, F. G. Vogt Company

As standards for acceptable criteria in conservation have advanced, the field of conservation has become more specialized. Benchmarks for professionalism, education and networking progressively exceed previous standards and the need for collaboration between the various conservation disciplines will likely increase. This is especially true of those conservators in private practice who do not have the staffing and technology resources of a large museum. Collaboration places demands on our ability to organize, communicate, trust and depend on one another to meet equal standards and work together to achieve the same goals.

Additionally, those in related professions need to be drawn into our pool of resources. For instance, non-material information about an object must also be considered when attempting to preserve an object's meaning, value and longevity. As Barbara Applebaum states in her thought provoking study, *Conservation Treatment Methodology* "Unless sufficient attention is paid to the object's non-material aspects, we may end up preserving the material but not the objects meaning." Understanding the necessary degree of non-material information about an object may lie outside the conservator's field of expertise. Obtaining this information may require further collaboration with scholars and experts who are not conservators.

The conservation of a gilded ceremonial armchair, owned by the James Monroe Museum and Law Library in Fredericksburg, Virginia, demonstrates how various professionals worked together to bring the project to a successful completion. These individuals included a lead conservator overseeing and organizing the project and providing the frame conservation, an upholstery conservator, a gilding conservator, surface and material analysts, along with information provided by numerous historians and curators. While somewhat small in scope, lessons in organization, teamwork, communication and information gathering can be drawn from this experience that can be applied larger projects involving more complex objects, an entire collection or museum interior.

John Kjelland, Aquazol, Louise Nevelson, Bicycles, the Adams Family and Me

Helen Alten, Director, Northern States Conservation Center

When Pepsi Syrup exploded over a Louise Nevelson sculpture during a reception, John Kjelland and I were working on furniture for the Adams House Museum in Deadwood, South Dakota. The call came into the Northern States Conservation Center lab and John insisted we drop everything and rescue the Louise Nevelson. We transported the sculpture to the lab and analyzed potential cleaning solutions that wouldn't disturb Nevelson's fragile paint layer. We had been laying down paint on the Adams House furniture using Aquazol and bicycle inner tube strips. We were able to use part of that technique to lay down the flakes on the Nevelson sculpture. The best cleaning solution was aqueous, but the paint was too fragile for swabs. We had been experimenting with PVA sponges for wet cleaning surfaces that traditionally could not be wet cleaned. It worked well on the Nevelson sculputure with modifications to create sponges that allowed for maximum control of the cleaning solution. On the Adams family furniture, the combination of a furniture conservator's approach and an objects conservator's approach led us both to try new materials and techniques for a significantly better result than either of us would have achieved individually. The treatments were analyzed using the QX3 portable microscope. John Kjelland died late in 2008. This paper is to honor his contribution to conservation and the time we spent together tackling problems new to both of us and teaching each other our personal tricks. He was extremely proud of having worked on a Louise Nevelson sculpture and featured it on his website and resume.

An Evaluation of Treatments for Waterlogged Lignum Vitae Sheaves

Susanne Grieve, Conservation Instructor, East Carolina University; Elsa Sangouard, Conservator, The Mariners' Museum

Over sixteen lignum vitae sheaves were recovered from the USS Monitor wreck site, some of which were found inside the iconic revolving gun turret. Having been submerged in the Atlantic Ocean since 1862, this collection gave conservators a chance to evaluate commonly used waterlogged wood treatments for one of the hardest natural woods. Each sheave was thoroughly documented, then subjected to one of the following treatments: air drying, polyethylene glycol (PEG) and freeze drying, PEG and air drying, acetone-rosin, lactitol-trehalose, and sucrose. Results of the experiment reveal that air drying is the most successful treatment for waterlogged lignum vitae.

The Neuroaesthetics of Art as Experience

Peter Muldoon, Conservator, Smithsonian Castle

As a species, ours is born to make connections in ways that are meaningful for us. We have a felt need for our lives to be meaningful. Aesthetic experience is a sensory-affective response which binds and unifies our fragmentary awareness. We have evolved the physical drive and capacity to satisfy our needs for aesthetic experience in the brain, making neural connections in a reciprocal process that enhances the conditions for our brains to continue evolving.

In 1934, American philosopher John Dewey described ***Art as Experience*** encompassing the process of art-making as the ***salience*** of human action, engaged with a heightened degree of attention and sentient awareness. Several hypotheses frame the emergence of art-making in evolutionary terms which presuppose art as adaptive for the species. I accept the premise and prefer a hypothesis of Ellen Dissanayake, ***Homo Aestheticus***, locating the evolution of art within the products of human ritual and creation of meaning over tens of thousands of years.

The conservation of historic and artistic works is an adjunct process to the creation of meaning. Since the future does not actually exist except in potential, conservation participates in creating meaning now, in the present. And advances in neurobiological imaging are now providing neuroscientists with tools to observe otherwise subjective experiences such as aesthetic response, lifting the veil of the mind from our hidden brain.

Conservators of cultural artifacts rarely discuss the nature of aesthetic judgment and experience although these values are central to our work. This paper explores ideas about the nature of art-making and empirical aesthetics from the literature of cognitive neuroscience, philosophy, linguistics and evolutionary psychology, known collectively as "Neuroaesthetics". My goal is to root art and conservation practice within the organic, evolutionary process of our lived experience, in our bodies and minds.

Changing Requirements for the Museum Environment: Baldachin Altar for the Holy Trinity

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Even the most well-preserved museum objects cannot escape of climate effects. For museum professionals is a challenged to improve these conditions that involve financial decisions on how to carry out a program suitable for their needs. The more important matter is to lessen climate impact that causes degradation in exhibition objects. Due to this important theme is crucial to develop a guidance that could be use by museum employees that specify preventive conservation items.

This paper explains the conservation of an ethnographic object called *Baldachin altar for the Holiest Trinity*, belongs to the collections at the National Museum of Anthropology (MNA). It was exposed in the 6th exhibit case named *Conjunto Ciclos Rituales*, located at the Pueblos Indios exhibition room.

The baldachin altar is a structure composes by a head wall, a four columns baldachin, a cupola and a crucifix. It was fabricated in Olinalá (Guerrero), where Nahua society lives until our days. This city is a lacquer objects production centre since the pre-hispanic.

In the XIX century the furniture developed in Mexico used decorations from models brought from Europe that present oriental subject-matter. These stylistic models were include and transformed in a novel variety of motives which are now part of the indigenous Nahua culture. The conjugation of both thoughts is part of a syncretism process that happened in this period, causing a new religious conception captured in decorative arts.

In addition, the Nahua society, as all Latin-American societies, has passed through a series of changes during its formation. For example, in the pre-hispanic period the Nahua's society received influence of other cultural groups that contributed with ideas and diverse practices to its cultural development.

The dimensions of the object vary according importance. The combination of several religion elements, that indigenous society re-interpreted with a strong conceptual basis support in rites, are a direct communication route between man and divinity and it is shown in the object structure.

Having these notions about syncretism, we can establish a conjugation of several meanings forms. To dividing the religious example that we find in the creation of the altar, the Nahua culture recognizes the appropriation of different meanings to create a new conception that is considered traditional.

The altar presented a critical deterioration condition because was exhibited inside a window case with diverse materials pieces (metal, stone, fiber and ceramics) that caused structural damages.

The restoration process developed an iconographic, historic and scientific research about every structure contented in the altar. After its restoration it would be exhibited individually for a period of time of two years and then will be store in the ethnographic collections deposit.

Although it carries diverse decorative styles from Mexico, Europe and Asia (materials, colors and designs) its conservation is important because represents the cultural, artistic and religious syncretism occurred in this zone of the country and; The baldachin altar for the Holy Trinity is one of the first ethnographic altars, part of the museum collection, which is an exceptional example of the Nahua's artistic development.

This project has been realized in collaboration with the conservation laboratory's MNA personnel, under de supervision of the conservator and restorer Mónika Pérez Pérez. The work took place between October, 2008 and February, 2009.

An Experimental and Practical Study of Some Consolidation and Coating Materials for Wood and Wooden Objects

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Some experiments have been done to test some consolidation and coatings materials for wood and furniture. Those materials included a variety of natural and synthetic materials those employed in making and preserving the cultural and artistic objects as furniture from the past and the present, such as shellac, Dammar, Rosin, Paraloid, Poly vinyl acetate etc dissolved in different solvents at different concentrates or percentages.

The experiments have been done applied to different wood species such as teak, sidder, pine and beech.

The testing included the behaviour of the material with the wood, the effects of the accelerated ageing to the material and how much protection the material gave to the wood that had been artificially aged. Again the materials properties such as tensile strength and hardness etc have been studied before and after the accelerated ageing. The result was that we decided to make a blending of use shellac 10% and then Paraloid B72, 5% as consolidation or coating materials.

The testing results manifested that shellac consolidates the wood cell walls very well and support it, while the Paraloid completes the consolidation process. The use of the two materials together helped to get the good properties of each one without their defects. Shellac has a fast drying rate, so by using it as undercoat it provided the wood with a clean surface that combined hardness and toughness with elasticity, good mechanical resistance and good adhesion to various surfaces, with a good and suitable tensile strength that dose not causing harm to the wood.

At the same time, by isolating the surface with Paraloid we avoided the sensitivity of shellac to humidity. While because the Paraloid that is not in direct contact with the wooden surface, it can be removed mechanically – when be damaged and become brittle or yellowed etc – without causing harm to the wood.

In this paper the experimental work with tests and the complete results will be described in detail.

Mapping and Predicting the Action of Organic Solvents on Wood: Search for a Dimension-Neutral Effect

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In-depth consolidation continues to be a treatment option for badly deteriorated wood. The solvents associated with consolidants, however, can cause dimensional changes to the wood. This response to solvents has been recognized and studied by researchers, notably Schniewind, de Bruyne, Nayer, Stamm, Ashton and Mantanis. A. Schniewind was the first researcher in conservation to look at the impact of solvents on wood and to postulate that swelling potential is related to the polarity of the solvent and consolidant. Historically, researchers have proposed different variables to predict the swelling potential: solvent/consolidant polarity, molar volume, dielectric constant, donor and acceptor numbers, cohesive energy density, and hydrogen bonding. On review of the published theories, it is clear that none are effective in conclusively predicting the behavior of wood exposed to a variety of organic solvents. The research at CCI focuses on the response of white oak and eastern white pine samples to a series of pure solvents: anhydrous alcohol, isopropanol, 2-butanol, toluene and pentane, and to a series of solvent blends: toluene-ethanol 1-1, toluene-ethanol 2-1, toluene-ethanol 4-1 and toluene-ethanol 6-1. Behavior of wood species was similar for a particular solvent, however, the rate and strength of the response varied with oak samples taking longer to respond, and exhibiting a greater dimensional change than the pine samples to all solvents. Findings show that ethanol swells wood significantly within normal treatment times, isopropanol and 2-butanol cause an initial shrinkage followed by swelling, toluene and pentane cause an immediate but restrained shrinkage that increases slowly over time. Blended solvents demonstrate non-ideal behavior. Preliminary results from the drying of oak samples indicate that a return to original dimensions at 50% RH is not evident in all cases, and that solvent effect on wood may be long-lasting.

An Update on using Reproduction finishes as predicators

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In 1997 I presented a paper to WAG on using Thomas Sheraton's Cabinet Dictionary, as well as other 18th-century manuals, for recreating a historic finish for reproduction furniture. The result is an approximation of how the furniture would have looked when it was brand new and is an interesting exercise for curatorial purposes. But in an historic house museum, the possibilities expand. If the reproduction goes into the room that the original furniture came out of, then the lighting and other factors could be similar to the first generation of use. In some cases the original furniture may exist, but is no longer associated with the house it came from. If the original is available then it can be compared to the reproduction giving a beginning and end point of the aging process.

It should be possible to also measure the some of the intermediary changes in color over time as the reproduction finish, and wood, ages. Using Munsel chips and other color measurement techniques, a subjective measure might be possible to predict how a piece of original furniture looked after the first, second, third, etc generation of the family's ownership. This matters since in a historic house setting, it is sometimes necessary to recreate a look for the particular time period, not always the original, that a historic house is interpreted for.

I have done this process for a Connecticut chest of drawers, a New York drop leaf table, and a set of three chairs. All used glazes and dyes and various resin varnishes based on 18th – century recipes. They were photographed shortly after they were given a finish and have now aged. The paper will report out on the results compared with photographs of their original look.