Wooden Artifacts Group Postprints

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Wooden Artifacts Group Sessions

Wooden Artifacts Group

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WOODEN ARTIFACTS GROUP

POSTPRINTS OF THE WOODEN ARTIFACTS GROUP SESSION
ANNUAL MEETING

2011 WAG

2011 ABSTRACTS (WRITTEN PAPER NOT SUBMITTED)

MIKE PODMANICZKY AND TRISTRAM BAINBRIDGE

The Recent Evolution of Furniture Conservation Study At West Dean College

ABSTRACT—This paper examines the developments in the study of furniture conservation at West Dean College, UK. The primary focus on practical skills has evolved to a more balanced conservation education incorporating theoretical and applied materials science and historical study. The paper explores the challenge of blending the appropriate levels of craft practice, hand skills and academic content in a conservation program.

West Dean College is one of the few institutions in the UK that offers full-time degree courses in furniture conservation. The college is housed in a 19th-century mansion situated in West Sussex, England and was the former family home of Edward James, a philanthropist best known for his patronage of the surrealist artists Salvador Dalí and René Magritte (fig. 1). It was Edward James who set up the college in 1971 as a school for the teaching of arts, crafts, restoration, and traditional skills that were in danger of being lost or forgotten. It was this focus on craft skill that underpinned the early years of the restoration courses in furniture, ceramics, metalwork, and clocks. Over the past five years, a restructuring of the furniture and related objects' conservation courses has seen a shift in focus from solely a high level of hand skills, towards a more balanced conservation education.

The program takes the notion of the holistic care and conservation of objects as comprising three integrated and overlapping areas of specialism: practical hand skills, theoretical and applied

Fig. 1. West Dean College.

materials science, and historical study. The nearby University of Sussex validates the year-long graduate and postgraduate diplomas with the option on the postgraduate diploma to convert, with additional studies, to a master's degree midway through the course. The program also runs a distinct course in historical furniture-making practices and professional development courses for experienced practitioners. Students come from a variety of backgrounds and the requirements for entry have been strengthened to suit the higher level of academic content. Whereas in the past, a prerequisite for entry was advanced cabinet making skills, this has shifted to a requirement for an undergraduate degree and proven practical capability. Students typically spend two years at West Dean, completing the graduate and postgraduate diplomas/master's courses. This brings students to an educational level expected of one entering the profession, generally at the level of an assistant conservator.

There is a strong emphasis on craft study and specifically historic practices. The conservation program runs alongside the furniture-making program where students can develop woodworking experience and learn techniques during a year intensive study. Some students may take this course as training for a career in furniture making or use it to improve hand skills in preparation for one of the conservation courses. In this way, students with little woodworking experience may learn enough practical skills to be accepted on the conservation programs.

One of the historic craft projects undertaken is the making of a 17th-century joint stool. A green ash log, recently felled from the West Dean Estate, is quartered, split, and rived into stock which is planed square by hand. The stool is constructed with hand-cut mortise and tenon joints, and joined with draw pins. This project encapsulates the principles of stock preparation and basic joinery where the emphasis is on producing tight, square joints and is less preoccupied with surface finish. Interior surfaces show the scoop marks of the scrub plane and draw pins are left untrimmed. This is closer to 17th-century priorities and part of the exercise is exploring these historical characteristics.

Students in the furniture-making program may continue along the historical technique model, with conservation students engaging with some of the projects in whole or in part. As hand skills develop, frame and panel making is learned along with more advanced "joint" chair making (fig. 2). Moving through the centuries of historical joinery, students may develop skills in 18th-century dovetailing, cabriole legs, creating serpentine curves in blockwork, and veneering. Students have produced a large array of furniture items, from dovetailed spice boxes to cabriole-legged chairs.

Conservation students are given the opportunity to explore historical practices other than joinery. With a wealth of processes to choose from, students have examined finishing processes from historical texts including European japanning, various gilding methods, and even Japanese urushi lacquer. The furniture department has seen the construction of a pole lathe to make barley twist spindles and a ripple molding machine. Through the process of historical making, students gain a greater understanding and sensitivity towards the historical objects they work on.

Fig. 2. Student-made joint stool from the historic craft project.

There is a ready supply of objects made available from both private clients and public institutions, and conservation students work on objects from the very start of the course. The college generates income through the conservation and making projects so there is always an interaction with clients in deciding and explaining treatment choices. Over the two years, a progression of skills is developed, generally from projects focusing on structural repair and loss replacement in the first year, to decorative surfaces and finishes in the second. A typical example of a first-year project was the conservation of an 18th-century mahogany chair, which arrived with fifteen others which had an assortment of missing and broken legs and stretchers (fig. 3).

In the case of missing elements, broken tenons were removed from mortises and fitted to new stretchers which were carved to accommodate the original material. They were attached with a bulked epoxy resin, and original surfaces were given a hot animal glue barrier layer. The seat rails, damaged by beetle and successive upholstery campaigns, were consolidated with thermoplastic resins. With a project of this nature, the fundamentals of conservation methodology can be learned: preserving the object's historical authenticity, creating a minimally intrusive solution to a problem, and ensuring that the solution has the greatest degree of retreatability possible.

Further projects serve to stretch and develop these basic skills with new techniques and a variety of objects. Over the two

Fig. 3. First-year conservation project: an 18th-century armchair, before and after treatment.

years, students have the opportunity to work on a good range of materials and objects. With the postgraduate students, the focus is on decorative surfaces with modules on gilding, transparent varnish, painted surfaces, and more complex loss replacement including inlay and marquetry. An unusual example of a postgraduate student project was a 19th-century Indian ivory inlaid bird, the only remaining part of a large daybed (fig. 4). After surface cleaning, warped ivory pieces were humidified, flattened, and re-adhered to the surface with Paraloid B-72. Curved losses were compensated with cast epoxy, bulked with calcium carbonate and pigments, and the flat replacement elements were cut from a cast epoxy sheet. The project stimulated a good debate on the ethical choice of materials as well as on the stability of various synthetic replacements. It also served to highlight the notion that replacements should be easily discernible from the original: under natural light, it was difficult to identify the replacements, but under ultraviolet illumination, they were readily distinguishable.

Fig. 4. Second-year conservation project: a 19th-century ivory inlaid bird, before and after treatment.

A weekly materials science module is integral to all conservation courses with the aim of engaging students in the use of science both in terms of its practical application to interventive conservation work, and its value in terms of understanding and advising on the long-term stability of objects and materials. There is currently no science requirement for entry in the course and consequently, the graduate module starts with no assumption of scientific knowledge. Whilst this may slow the pace of teaching in the early months of the course, it is generally found that the learning environment supports fast learning.

With funding from a Getty grant in 2009, the college was able to acquire new instruments to augment the analytical laboratory, which now contains a fluorescence microscope, a portable XRF spectrometer, a colorimeter, and an FT-IR spectrometer (fig. 5). The last few years have seen the creation of a course in cross sectional fluorescence microscopy, specifically designed for the needs of furniture and wooden objects. It aims to furnish students with the skills to identify varnishes, paint binding media, and other coatings, and to understand how a cross section can inform and guide treatment choices. The use of the analytical instruments becomes particularly relevant to the master's students who typically work on a research question around a specific conservation issue. The project is written up in a 10,000 word dissertation through an extra fourth, summer term at the end of the second year.

The study of material culture is intended to ensure that all students have a solid understanding and appreciation of the context wherein the objects of their specialism were created and used. Subjects covered include decorative arts history as it is

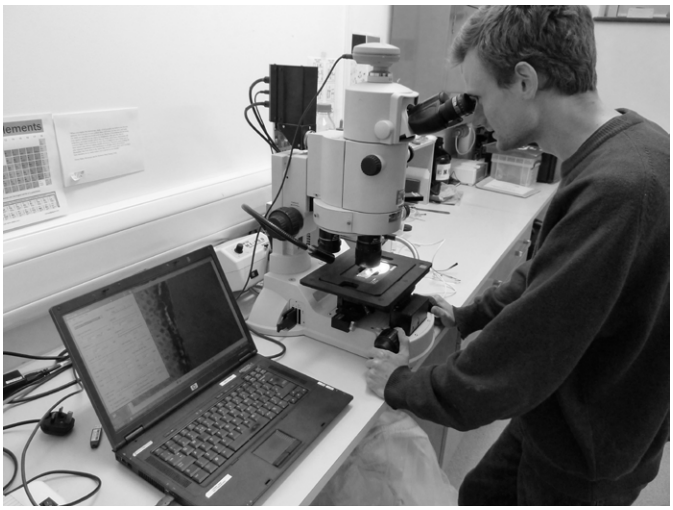

Fig. 5. The analytical laboratory and the fluorescence microscope in use.

manifested in common themes of fashion, style and design progression, historic interiors, and social and cultural trends. At West Dean, material culture is studied in two ways: as an interdisciplinary lecture series for all students and as related to students in individual disciplines by each program tutor. Material culture study during the postgraduate year is primarily an individualized pursuit, negotiated with the program tutor when it is applicable to specific conservation research.

The college is located within near distance of a number of 17th- and 18th-century country houses with large collections of fine and decorative arts, enabling students to examine objects within a period context. An annual study tour to historic houses and collections further afield affords close examination of objects and allows students to discuss issues of collections care with curators and conservators. On leaving West Dean, students have gone on to jobs in heritage institutions internationally or in private conservation workshops. Although internships are not a course requirement, a number of students take shorter work placements during the two years and may embark on longer internships after graduation.

Striking a balance between practical bench work and the scientific and theoretical aspects may at times be challenging, but West Dean does well in the provision of resources and guidance for students to make their own paths. With many students living in campus and with the facilities open all week long, there is an atmosphere of productivity, with ambitious projects undertaken. For most, the learning curve is steep yet greatly rewarding.

AUTHOR BIOGRAPHIES

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TRISTRAM BAINBRIDGE completed the West Dean furniture conservation master's course in 2011. He is currently working as a furniture conservator at the Victoria and Albert Museum and as a part-time associate tutor at West Dean.

CHRISTINA BISULCA, SUSAN BRAOVAC, NANCY ODEGAARD, AND HARTMUT KUTZKE

Consolidation of Alum-Treated Wood with Alkoxysilanes

ABSTRACT—At the Museum of Cultural History, University of Oslo, a pilot study was undertaken to assess tetraethoxysilane (TEOS) based consolidants as a potential stabilizing material for alum treated wood. Preliminary results indicate that TEOS treatment can reduce friability and in certain applications results in a marked increase in strength. It is able to evenly penetrate remaining wood structures, but does not infill pores within wood cells. In this study alum removal was possible even after TEOS consolidation. This is a significant advantage because it indicates that TEOS consolidation may not interfere with future retreatment of these artifacts.

1. INTRODUCTION

Alum treatment of waterlogged wood was used frequently in Scandinavia in the late 19th and early 20th centuries. The treatment entails the immersion of wooden objects in a hot alum solution ($KAl(SO_4)_2 \cdot 12H_2O$), so that when removed, alum salts will recrystallize within the cells of the wood to prevent distortion and shrinkage during drying. At the Viking Ship Museum, administered by the Museum of Cultural History, University of Oslo (KHM), many of the wooden artifacts excavated in 1904 from a Viking age burial in Oseberg were treated with alum. The Oseberg find, dating to the early ninth century, contains some of the most ornately carved Viking age wooden objects known in the world. The site itself is a burial for two high-standing women in a large ornamented ship, along with various other goods including several intricately carved wooden sleds, a wagon, domestic items, and textiles. Many of the intricately carved smaller wooden finds were too unstable to dry without intervention and were treated with alum shortly after their excavation (Rosenqvist 1959). The Viking ship, constructed out of heartwood oak, was reassembled without alum treatment (Brøgger and Schetelig 1928).

Over the 100 years since their initial treatment with alum the artifacts today are exceedingly fragile and many can no longer support their own weight. The detrimental effects of alum treatment have been noted in other institutions throughout Scandinavia. Many objects today show cracking, darkening, and powdering, which in extreme cases lead to almost complete loss of the artifact (Child 2002; Häggström and Sandström 2013). In order to preserve these delicate objects, KHM initiated the "Alum Research Project" to compile accurate information on this now obsolete treatment method, understand its effects, and devise appropriate preservation and reconservation methods. Important findings of the Alum Research Project relevant to potential reconsolidation treatments are that alum-treated wood is now highly acidic, with a pH down to 1. This high acidity has caused continued deterioration of the wood. The most significant deterioration appears to be continued hydrolysis of the cellulose component, which makes up the bulk of the cell walls. The remaining wood is now primarily lignin (Braovac and Kutzke 2012).

Several institutions in Scandinavia are exploring reconservation methods for alum treated wood. Methods under investigation involve the removal of alum in a water bath followed by reconsolidation with stable materials or freeze drying (Bojesen-Koefoed and Stief 2012; Häggström and Sandström 2013). However, given the fine, delicate carvings on many of these artifacts, which are unique and of significant historical importance, such treatments may be too high risk and may cause an unacceptable level of damage. Furthermore, many objects have been highly restored from hundreds of fragments which are likely not possible to undo without causing great damage. As part of the Saving Oseberg project, KHM is currently investigating several potential stabilizing materials and methods outside those typically used in conservation.

Due to the fragile and highly acidic nature of alum-treated wood, the requirements for a successful stabilizing material are considerable. Any treatment material must be able to completely penetrate the objects and have good long-term stability. A significant requirement for conservation treatment, as outlined in the AIC's code of ethics, is the reversibility of any added materials. However, in practical applications with exceedingly fragile objects, this is not always possible. Even "reversible" materials may result in significant damage to the artifact during any attempt at their removal. In these cases, the nature of the artifact may warrant the use of irreversible treatments. When using irreversible consolidants, an important consideration is the possibility of retreatment in the future. For the alum-treated artifacts at KHM, this includes the application of additional consolidants as well as alum removal if necessary ("retreatablilty" vs. "reversibility"). In an evaluation of consolidant properties at KHM, Christensen et al. (2009) proposed that a consolidant that stabilizes artifacts while still leaving open porosity would be optimal, because it would allow the option of retreatment in the future.

The organosilane TEOS is one potential consolidating agent. The advantage of TEOS-based consolidants is their low viscosity allowing for complete, even penetration. TEOS systems have been successful in stabilizing other fragile brittle materials without infilling open pores within the substrate (Wheeler 2005;

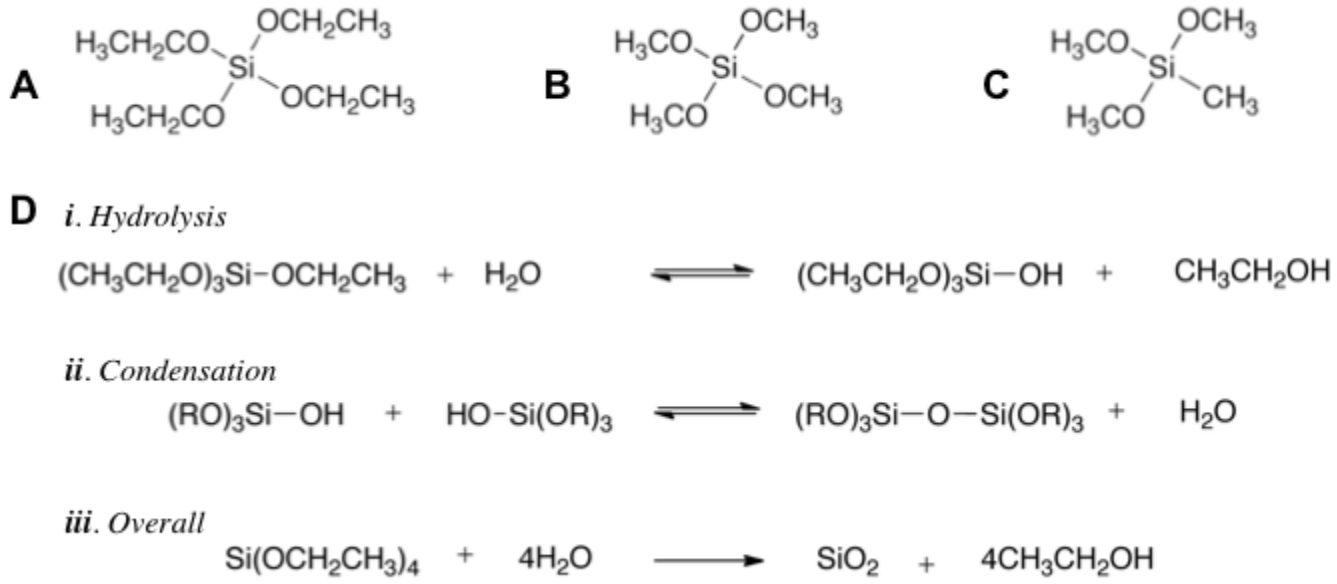

Fig. 1. **A.** Tetraethoxysilane (TEOS). **B.** Tetramethoxysilane (TMOS). **C.** Methyl-trimethoxysilane (MTMS). The hydrophobic methyl group imparts increased water repellency to the substrate after treatment. **D.** Reaction of TEOS. Hydrolysis (i) and condensation (ii), with R = OCH_2CH_3 or OH (condensation can occur before complete hydrolysis). (iii) Overall reaction of TEOS.

Bisulca et al. 2009). TEOS releases only ethanol as a by-product upon cure, which is more easily adapted for onsite applications where objects cannot be placed in a fume hood during treatment.

2. BACKGROUND

TEOS (formerly "tetraethyl orthosilicate") and other common organosilanes used in conservation are shown in figure 1. Alkoxysilanes are commonly functionalized with a hydrophobic alkane group, which imparts water repellency to the substrate after treatment. They polymerize in a two-part hydrolysis and condensation reaction forming Si-O-Si (siloxane) bonds (fig. 1). The reaction takes place with water: in conservation, this is usually carried out using atmospheric moisture or water present within the substrate (Wheeler 2005).

While this treatment is not reversible, organosilanes have many advantages over other more common consolidants. The primary advantage is that they are low viscosity and polymerize in situ, allowing for full penetration into the substrate. In the conservation of stone, organosilanes have been used since the 1960s, and have been shown to have good long-term chemical stability, with high UV and thermal resistance (Wheeler 2005).

Organosilanes have been used for the treatment of wood in commercial industries since the 1980s. Alkoxysilanes and various organo-functional silanes have been successful in imparting specific properties to lumber, such as improved dimensional stability, durability, fire resistance, and increased water repellency (Mai and Militz 2004). Organosilanes have been less commonly used in wooden artifact conservation. For the treatment of waterlogged wood, dehydration followed by immersion in TEOS has been tested with mixed results (Irwin and Wessen 1976; Jespersen 1982). More recently, Smith (2002, 2003) successfully used immersion in MTMS (fig. 1c), sometimes in conjunction with silicone oil for both the treatment and retreatment of waterlogged wood.

In the conservation of stone, alkoxysilanes have been found to be most effective when there is a chemical interaction with the substrate (Wheeler 2005). The polysiloxane networks can bind to surface hydroxy groups in cellulose, as well as with hydroxy and phenolic groups in lignin (Mishra et al. 2009). Due to the presence of these interactions, it is expected that TEOS will be a successful consolidant for alum treated wood.

3. MATERIALS AND METHODS

The preliminary investigation of TEOS consolidation was assessed using the Remmers Stone Strengthener products, which are similar to PROSOCO's Conservare available in the United States. These are one-part TEOS-based systems with the neutral catalyst dibutyltin dilaurate and some residual ethanol from partial polymerization of the monomer. Remmers KSE 300 is TEOS (60%–80% w/w) with residual ethanol. KSE 510 is a pre-polymerized formulation (20%–40% w/w), which will deposit a higher percentage of silica (Remmers 2009, 2011). KSE 300 is TEOS with a low degree of polymerization, and likely exists as monomers, dimers, and trimers. Based on comparison of KSE 510 to other commercial products with similar reported percent volume of silica, the formulation probably contains ethysilicate oligomers of on average five monomers (Cihlár 1993).

Samples tested were Viking Age alum treated wood from a weaving loom (cat. No. C55000/185). The object is in 6 separate sections (labeled 1-6) where each section shows visible increase in deterioration. Sample 185-6 has the most severe darkening and is the most friable, sample 185-1 shows the least. Samples used for testing were from sections 1 and 6.

Fragments were treated by both drip application and immersion. For drip applications, successive applications were applied until saturation, i.e. the sample no longer accepted additional TEOS and it pooled at the surface. Successive applications on the same sample were applied at twenty-four-hour intervals. Samples were left in ambient conditions (RH ~ 50%) and allowed to set for at least two weeks before analysis, although full cure may require over this time period (Bisulca et al. 2009).

Treatment procedures were assessed by visual appearance, percent weight gain, scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS), and strength increase. Strength increase was qualitatively assessed based on examination with a scalpel. After allowing for complete cure of TEOS for a period over two months, consolidated samples were washed in deionized (DI) water overnight to remove alum salts. The presence of alum before and after treatment was determined by Fourier transform infrared spectroscopy (FTIR) on sample fragments.

Fourier transform infrared spectroscopy was performed on an Avatar 360 FTIR spectrometer with an ATR attachment, equipped with a He-Ne laser and CCD detector. Spectra were recorded in reflection mode, from 4000 to 650 cm^{-1}, 256 scans at 4 cm^{-1} resolution, and using OMNIC ESP 6.1a software. Scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) was performed on a JEOL JSM-840 scanning electron microscope equipped with an Oxford Link Isis X-ray microanalysis detector and INCA software. EDS was performed on carbon-coated samples at 12 mm working distance, 20 keV.

4. RESULTS AND DISCUSSION

4.1 SEM/EDS

SEM analysis of a cross section of alum-treated wood after TEOS consolidation is shown in figure 2. TEOS was found to polymerize on and within remaining cell structures without

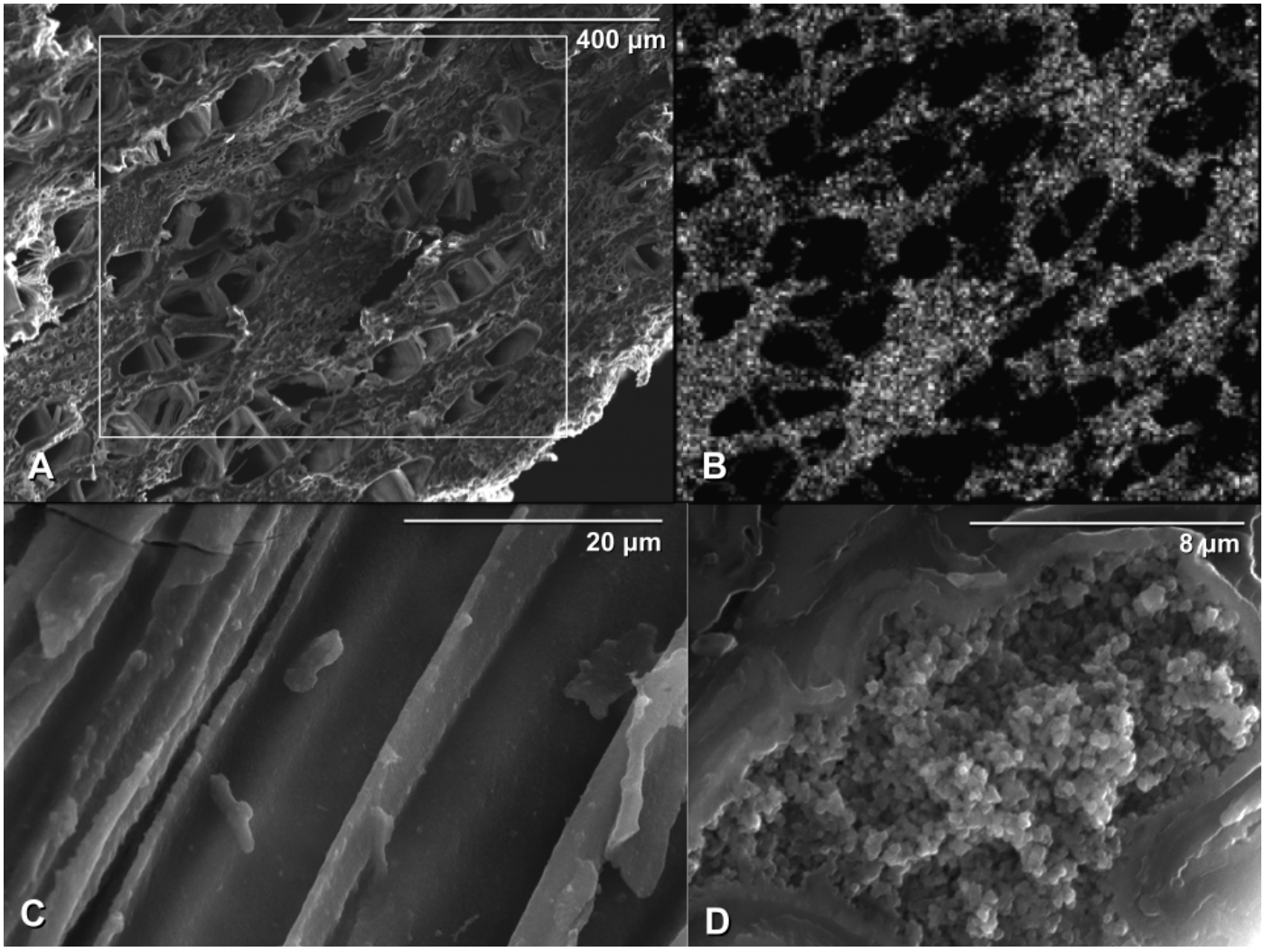

Fig. 2. SEM images of wood samples after consolidation. **A.** Sample treated with immersion (2 hours) in Remmers 300. **B**. SEM/EDS map of A (boxed area) showing the distribution of Si within the sample after treatment. **C.** Sample treated with two drip applications of Remmers KSE 510. **D.** Micro pore (approximately 15 µm) that is filled with colloidal silica particles after immersion treatment (6 hours) in Remmers KSE 300.

Fig. 3. Untreated (left) and TEOS treated (right) samples. The consolidated sample was treated with seven drip applications of Remmers KSE 300, applied at one-day intervals.

infilling pore spaces within cells. In SEM/EDS analysis of cross-sections, the deposited silica appeared evenly distributed throughout the cell walls, and microstructure of the wood is preserved. In most cases, the deposited silica is not visible, and is only observed in EDS maps. However, with repeated applications and in immersion treatments, colloidal particles of TEOS are seen on the surface of cell walls and microstructures of the wood cells (fig. 2d).

In all treatments, even with immersion, large pore spaces are not infilled with silica (figs. 2a, 2b, 2c). Only smaller pore spaces (< 20 μm) were filled with silica, as is shown in figure 2d, where silica appears as small colloidal particles within micro pores of the wood. The non-gap filling nature of TEOS consolidation is a known property, and in general TEOS consolidation will not fill gaps of ~50 μm or more (Wheeler 2005).

The open porosity left with TEOS treatment is a significant advantage over other materials, which can leave the wood as a completely infilled plastic "block" (Christensen et al. 2009). The open porosity that remains after TEOS consolidation would allow for the future application of other consolidants if necessary—i.e. the wood is retreatable.

4.2 visual examination and strength increase

TEOS consolidation does impart additional strength to samples based on qualitative examination with a scalpel. Treated samples were less friable and less subject to fracture and splintering with handling (fig. 3). As expected, the pre-polymerized 510 formulation resulted in increased weight gain per application as compared to neat TEOS (KSE 300). Comparing two drip applications of KSE 300 with KSE 510, the percent weight gain was 24% and 150%, respectively. However, the increased deposited silica with pre-polymerized formulations had no significant effect on the strength increase based on this qualitative assessment. Similar observations have been noted in other studies using TEOS for the consolidation of waterlogged wood (Jespersen 1982). In the present study, samples that had multiple applications of neat TEOS showed the most significant increases in strength. Greater strengthening effects with repeated applications are likely due to continued polymerization to the previously deposited silica network, where additional applications are able to infill any cracks formed during drying, or polymerize in regions of incomplete reaction. Similar effects have been observed in other studies (Haereid et al. 1995).

TEOS consolidation resulted in significant darkening of wood (fig. 3). Darkening was most prominent with KSE 510-treated samples, and is attributed to effects of the residual ethanol in the formulation. Immersion treatments also resulted in significant darkening. In immersion treatments, darkened materials/deterioration products were also dissolved out of samples into the immersion bath. As such, immersion treatments are not

appropriate for treating these highly deteriorated wooden artifacts. The greater success of consolidation with repeated drip applications is a significant result; many of the early experiments using TEOS in wood conservation assessed only immersion treatments (Irwin and Wessen 1976; Jespersen 1982).

The exact nature of the observed darkening with TEOS treatment is not fully understood. The application of acetone or ethanol alone also causes similar darkening of samples. This color change is possibly caused by the migration of solvent-soluble deterioration products to the surface during cure. However, in many cases the darkening is found throughout the entire wood sample, and may actually be due to a reaction with ethanol or acetone and with the wood itself. Observed darkening was greater with the pre-condensed formulation, which contains a greater percent of residual ethanol in initial application. The effect of solvents on the wood was unexpected. If the darkening is caused by a reaction with solvent, the reaction could occur with ethanol released during the polymerization reaction of TEOS. TEOS formulations that are pre-condensed and distilled to remove residual ethanol should reduce these effects, and warrant additional investigation.

4.3 TEOS CONSOLIDATION AND ALUM

TEOS consolidation did not appear to have any effect on the alum present in samples. In SEM images, alum crystals appeared the same before and after treatment, even in the case of immersion treatments. This was expected with a non-aqueous treatment, as alum is insoluble in alcohol. Figure 4 shows alum crystals present within cell structures after immersion treatment in KSE 300. Figure 4b shows a high-magnification image of the surface of one of the alum crystals. The silica appears to have formed a thin coating on the surface of crystals, as is apparent from the microcracks on the surface. This is most likely due to the TEOS reacting with water present in the crystal hydrate.

After consolidation with TEOS, it is still possible to remove alum from samples. Samples were washed in DI water baths overnight, removed, and allowed to dry. The water bath was also evaporated for analysis. Figure 5 shows FTIR spectra of consolidated wood samples before and after washing. In consolidated samples, the presence of alum in the wood is most apparent in FTIR spectra by the water of hydration peaks at ~3330 cm^{-1}, 2900 cm^{-1}, and 2470 cm^{-1}. For the sample treated with two applications of KSE 300, the alum was significantly reduced after one DI wash, which can be seen in FTIR spectra by loss of the water of hydration peaks associated with alum. For the sample treated with seven applications, the overnight wash was repeated twice to further reduce alum content. Again, alum removal can be seen in the FTIR by the loss of water of hydration peaks in washed samples. In both cases, the residue left from evaporation of the water bath was found to contain only alum (figs. 5a, 5b, dashed lines).

The fact that organosilane consolidation does not "encapsulate" salts is known from research in stone conservation, and in some studies salt removal has actually been found to be more efficient after consolidation (Wheeler 2005). Given the possibility of alum removal, there is also the potential use of TEOS as a pre-consolidation treatment to strengthen the artifacts prior to neutralization or washing in water, followed by consolidation with other materials.

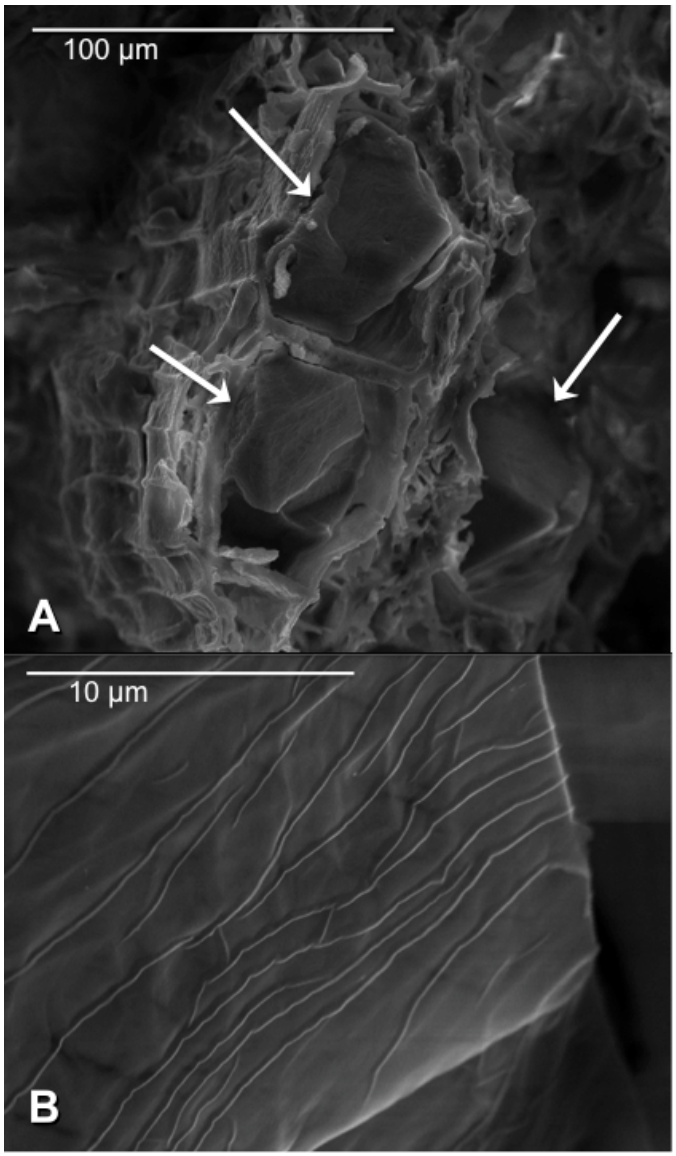

Fig. 4. **A.** Alum crystals present within wood cells after immersion treatment in Remmers KSE 300, indicated by arrows. **B.** Detail of the surface of an alum crystal in A.

4.4 LIMITATIONS

There were some problems associated with TEOS treatment noted in this pilot study. In SEM images of many consolidated samples, microcracks were found throughout the wood cells. The silica formed in the polymerization of TEOS is brittle, and stresses generated during cure will result in crack formation

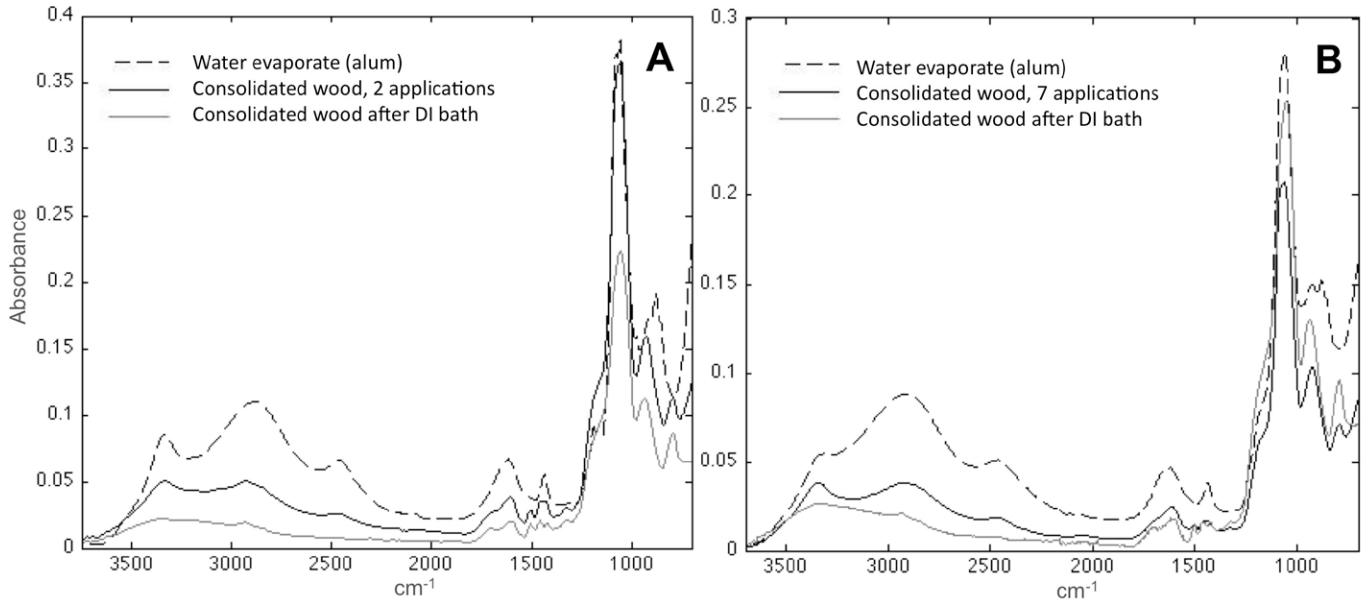

Fig. 5. FTIR spectra of samples consolidated with Remmers KSE 300 before and after alum removal. **A.** Spectra of a sample treated with two drip applications showing the reduction in alum after washing in water. FTIR analysis of the water bath evaporate showed only alum (dashed line). **B.** Sample treated with seven drip applications of TEOS before and after DI rinse.

(Scherer 1988; Wheeler 2005). In stone conservation, organosilane formulations with additives or functionalized alkoxysilanes with greater flexibility have been used to reduce these problems (Doehne and Price 2010). These formulations may be beneficial for the stabilization of alum-treated wood.

In some samples, salt migration occurred during polymerization of the TEOS consolidants, as well as surface polymerization of TEOS on wood samples (see figs. 6a, 6b). In the case of salt migration, this phenomenon was most commonly observed with consolidation using the pre-polymerized formulation. In EDS analyses, the salts showed K and S indicating potassium sulfate. It is not known why certain salts were found to migrate to the surface after application of TEOS in some samples and not others.

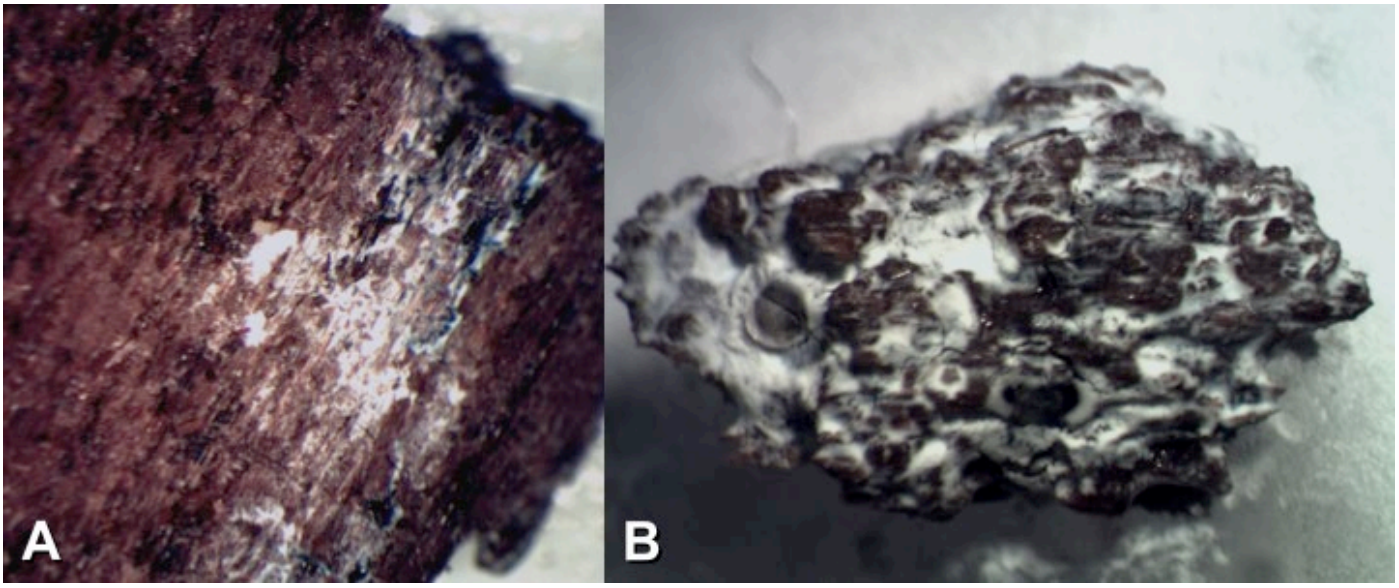

Fig. 6. **A.** Migration of salts to the surface of a sample treated with two drip applications of Remmers KSE 510. **B.** Silica polymerized on the surface of a sample after pre-washing with ethanol followed by one drip application of Remmers KSE 300.

In the case of surface polymerization, this problem was observed when samples were pre-washed in ethanol, allowed to dry overnight, and then consolidated with TEOS. This is likely a result of excessive moisture present within the sample due to inadequate drying (standard ethanol can contain 5%–10% water by volume). Adequate drying of the substrate is an important consideration for TEOS treatment in practical applications: if artifacts require pre-cleaning prior to consolidation treatments using standard lab grade solvents, artifacts must be sufficiently dry for TEOS consolidation to be successful.

There are many other potential complications not investigated in this preliminary study, but which need consideration if TEOS treatment is to be used on actual artifacts. This preliminary investigation assessed small fragments of wood, and it is unknown if TEOS consolidation can sufficiently strengthen larger wooden elements. Many of the Oseberg finds were reconstructed using fills, screws, wood putty, as well as surface coatings like linseed oil (Braovac and Kutzke 2012). How the presence of these materials will affect the polymerization of TEOS is not known. There are many experimental parameters for TEOS treatment that were not addressed in this initial study, and more research is needed to determine if TEOS consolidation can be successfully adapted for the stabilization of alum-treated artifacts.

5. CONCLUSION

TEOS is only one of several materials tested as a potential stabilization agent for alum-treated wood by the Alum Research Project. Preliminary results indicate that it shows promise and is worth of further evaluation. The primary advantage of TEOS consolidation is that it does not fill the interior of wood cells after treatment. The open porosity left after treatment is considered a significant advantage to TEOS consolidation, and will allow for the application of additional adhesives and consolidants if necessary. Moreover, this study suggests it is possible to remove alum salts even after consolidation. Conservators must consider the face that TEOS treatments are irreversible and further investigation is needed before it can be used on real artifacts.

SOURCES OF MATERIALS

Remmers KSE 300 and KSE 510
Samson Enviro,
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JOAN PARCHER

Beautiful Brass: A Fresh Look at Historic Furniture Hardware

ABSTRACT—This paper presents a brief overview of 18th- to early19th-century furniture hardware with a focus on methods of production and fabrication, identification, characteristics of various brass manufacturers, and metal finishes. The development of the author's collection is discussed as well as the trade in furniture brasses, and ethical considerations in dealing with historical hardware.

1. INTRODUCTION

As a metalsmith, the author has been involved with repairing and making reproductions of historic brasses for 30 years. The impetus for beginning a collection of furniture hardware occurred in 2004 at a going-out-of-business sale at a local junk store. The author overheard two people inspecting a period Chippendale brass and discussing how glitter and sequins would transform it into a beautiful Christmas tree ornament. She immediately began to gather the remaining furniture hardware. Since that incident, the author has assembled a large study collection of early brasses. Selected items are shared in this paper. The author begins the discussion with a general overview of tools, tool marks, and construction techniques and then focuses on illustrating the many makers' marks and the wonderful variety of brass patterns.

Fig. 1. A group of brass back plates and escutcheons made between 1700 and approximately 1745. These objects were sand-cast with a beveled edge on one side. The surface of each plate was refined with a triangular scraper and decorated by hand with chasing and matting tools and occasionally, engraving tools.

2. TOOLS AND TOOL MARKS

2.1 SCRAPERS

Rough castings were smoothed and cleaned primarily by employing a triangular scraper (figs. 1–3).

Fig. 2. Triangular scrapers; the small one on the right is a sail maker's needle that has been sharpened and fit into a handle.

Fig. 3. The beautiful waves on the face of this back plate were created when the triangular scraper was used to remove the rough surface inherent to the sand casting process. The delicate chatter lines on the beveled edges of 18th-century cast brasses were made with hand-files or sometimes with a triangular scraper.

2.2 CHASING AND MATTING TOOLS

Chasing and matting tools, also called stamping tools were used to decorate many of the early 18th-century brasses. The matting tools exhibit textured patterns (fig. 4).

Fig. 4. Detail of chasing and matting tools: The designs and patterns were stamped into the brass after casting.

2.3 ENGRAVING LINERS

Liners are used to engrave rows of parallel lines (fig. 5). Note the different effects produced by the matting tool and engraving liner (fig. 6).

Fig. 5. Engraving liners: White watercolor highlights the pattern of parallel lines that will be engraved by the tool.

Fig. 6. One can clearly see the rows of parallel lines from the engraving liner decorating the winged forms and circles in the top brass. The "shaded" areas (top and around keyhole) in the bottom brass were made with the matting tool.

2.4 LATHE

Although these early 18th-century drop pulls (fig. 7) are covered in thick green paint, and their cotter pins are long gone, it is apparent that they are a lovely old set. Reproductions of this type of brass have been made for well over a hundred years; however, these wear patterns and tool markings will not be found on reproduction hardware.

Fig.7. Set of drop pulls; notice that the hole in each drop exhibits a different wear pattern. The round sand-cast rosettes were clearly finished on a lathe, and a burr still remains in each center hole (see top left).

3. MANUFACTURERS' MARKS

Maker's marks were almost always generated during the production of the hardware (fig. 8, 9). They were rarely applied afterward. The author has seen only one example where a maker's mark was stamped directly into a brass after manufacture. Marks also appear for both size and part identification (fig. 10). Often the posts and securing nuts that supported the bails were also cast with corresponding markings. The author has even found a securing nut marked with a tiny 'A' for its maker.

Fig.8. A selection of decorated plates with their maker marks, highlighted by white watercolor. "ET" has been attributed to Edward Tipper, and "IP" may be John Pulley of London. "RM" has not been researched. Observe the charming little star between the "I" and the "G" on the bottom plate.

Fig.9. These maker marks are unidentified.

Fig.10. Note the numbers and the Roman numerals on the ends of the top two bails. These markings are for size or part identification. (The bails with the Roman numerals are possibly by John Clarke and Son of Birmingham). The lovely form of the large lift handle looks as though it was sculpted by a triangular scraper and a burnisher. Please note the beautiful lines made by these tools. It is doubtful that similar lines would be found on a reproduction bail. This lift handle feels like silk.

The author has collected dozens of brasses with different examples of manufacturers' marks. Research on these marks is fascinating. Thomas Hands and William Jenkins provide an interesting and instructive example of the history of a maker's mark over an extended period. In his book *Metalworking in early America*, Donald Fennimore identifies the maker's mark 'HJ' as Hands and Jenkins. They worked in Birmingham, England, from approximately 1791/1797 to about 1805 (fig. 11) (Fennimore 1996).

Posts marked with notches are typical for Hands and Jenkins. The number of notches and grooves specify the size of the post. Eventually HJ began using a securing nut that was marked with a size number (fig. 11).

Rarely, one encounters a variation in the Hands and Jenkins maker's mark. 'HJr.' seems to have been used for a short time on their earliest brasses. There has been speculation about the meaning of the lower case 'r.' but it is probably an old-fashioned abbreviation for the words "maker" or "junior."

Hands and Jenkins made well-crafted and beautiful products. Early HJ knobs used unique construction methods: the threaded post was secured up into the underside of the hollow knob face with a square attachment (fig. 12). The square attachment was then riveted through a custom-made iron washer, which is hidden inside of the hollow knob. This method of manufacture prevented the threaded post from twisting loose with use. It gave great strength to even the most delicate examples of HJ's knobs.

Although Hands and Jenkins seem to have dissolved their partnership by 1805, Jenkins certainly kept his brass hardware business going strong. In 1811, he was awarded a patent for "flat backed handles." He marked these handles with "patent" or "WJ."

In 1811, Jenkins was awarded patents for furniture knobs (fig. 13). Occasionally, the word "PATENT" is also embossed into the steel cup-shaped back of the knob.

The author has noticed a rather obscure maker's mark that was used on many but not all HJ- and WJ-pressed brass back

Fig.11. These are examples of pressed brass eagle pulls with the HJ maker's mark on their cast bails. These brasses have identical patterns; however, the top set is earlier. It has very distinctive notches in its posts and substantial round securing nuts. The securing nuts on the bottom set are clearly numbered. The posts on the bottom set are also lightly marked with grooves. (It is not unusual for highly desirable eagle brasses to be used to upgrade a piece of antique furniture. In a poor economy, case furniture can easily be purchased at low prices and the hardware removed.)

Fig.12. Examples of hollow pressed brass knobs made by Thomas Hands and William Jenkins illustrating their construction techniques. Note the HJ maker's mark in each knob back plate. The spool-shaped base and the back plate are secured to the knob with the large square iron nut. This iron nut screws up underneath the pressed back plate.

Fig.13. This may be an example of a knob made by William Jenkins, patented in 1811. The "Pat." mark and the number on the securing nut are clear. The back of this knob is made of steel, which may be William Jenkins's innovation.

plate patterns: It is a small distinctive circle or dot marking on the edge of the brass (fig. 14).

In addition to Hands and Jenkins, many other manufacturers of furniture hardware signed their work. The author suggests identifying the "W" mark with Samuel Walker (fig. 15). There were several individuals with the last name of Walker involved in the brass business in Birmingham, England, during the first quarter of the 19th century. Some were related. They worked as metal refiners, founders, metal rollers, wire makers, etc. In James Pigot's *The commercial directory for 1818, 1819, 1820*, Samuel Walker was listed as "brass founder, cabinet" (Pigot 1918).

Fig.14. A pressed brass back plate with the "circle-dot" mark is certainly made by Thomas Hands and/or William Jenkins.

Fig.15. An example of a pressed brass back plate with a delicate "W" maker's mark on its top edge, possibly made by Samuel Walker of Birmingham, England.

4. MATERIALS

4.1 METAL COMPOSITION

Period hardware was cast using a brass alloy primarily consisting of copper and zinc (figs. 16, 17). The color of modern casting brass tends to be pale and pink in comparison to the yellow brass used in the 18th and 19th centuries. This is because the alloy currently used often contains aluminum and manganese. When the author is called on to copy period hardware she uses a caster (Harrison Casting, Johnston, RI) who allows her to provide the brass (yellow brass alloy 360).

4.2 METAL FINISHES

Out of the thousands of cast drawer pulls examined by the author that were manufactured during the first three quarters of the 18th century, perhaps only a few have traces of gold or silver gilding. (On extremely rare occasions, furniture hardware cast from sterling silver is encountered.) Most often this brass hardware was simply coated with a golden yellow colored lacquer (figs. 1, 16, 17).

Numerous metal finishes were used on pressed and cast brass hardware in the late 18th and early 19th centuries. The author has encountered plain polished brass, colored lacquer coatings (figs. 18 and 19), burnished gold gilt brass,

Fig.16. A selection of sand-cast brasses from about 1750–1780, some with slight traces of their original lacquer coatings.

Fig.17. Examples of pierced brasses with traces of their original lacquer coatings. These things are like snowflakes. The backs of these brasses have been carefully considered. They were cast with a beveled edge around each opening, which enhances the delicate beauty of the pierced design.

Fig. 18. Examples of a few of the fabulous patterns of pressed brass back plates. The imagery is wonderful. Notice the pineapple and unbroken chain, the seashell, flower baskets, fruit, birds, animals, etc. The different colored lacquer coatings are still visible on some of these brasses.

Fig. 19. Early19th-century castors with colored lacquer coatings. The small castor is signed under the toe by Yates & Hamper. It is beautifully constructed. The large castor is 7¼ in. long. It is marked on the inside with "TS" possibly for Timothy Smith, Birmingham. All of the "fur" on this castor has been expertly carved with an engraving liner. Note the second wheel, which helps to support and aids in the function of the main wheel. The previous owner rescued this particular set of castors from a World War IIera metal scrap yard in New Jersey. Thankfully, they were never recycled for the war effort.

and Sheffield silvered brass. Occasionally, one finds brasses with two-toned finishes such as silver with plain brass, a combination of shiny and matte gold, or brasses highlighted with japanning or paint. The author has observed pressed brasses accented with red, green, blue, black, and white paint (fig. 20).

5. CONCLUSIONS

A large number of objects in the author's collection were a day away from being consigned to the junkyard and sold as scrap brass. Old furniture hardware is often considered to be trash. It is the author's goal to save and document as many examples of the different brass patterns as possible.

Fig. 20. Examples of late 18th- and early 19th-century pressed brass knobs illustrating some of the beautiful patterns and a few of the metal finishes that were favored at this time. Several of these knobs were made by Thomas Hands and William Jenkins.

This furniture brass photo archive is intended for research. If you have an interesting period brass pattern that you would like to contribute, please e-mail the image to the author.

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Changing Attitudes Toward Musical Instrument Conservation in Russia

ABSTRACT—Museums in St. Petersburg and elsewhere in Russia preserve many European and non-Western musical instruments of great historical and aesthetic significance. As late as 2010, long-standing lack of proper facilities and of professionally trained instrument conservators had posed serious problems for the instruments' preservation. More troubling was pressure to use delicate instruments in performance without adequate safeguards, entailing familiar risks. The author, sympathetic with museum staff faced with these conditions, discusses some social and political issues surrounding this situation, which nowadays shows improvement partly resulting from better communication with museum professionals in Western Europe and the United States.

In keeping with this meeting's theme, the author discusses the philosophies, principles, and policies he observed mostly in St. Petersburg, where many of Russia's most important musical instrument collections are kept. His views are critical, but he does not mean to impugn his colleagues' motives or skills, or claim that his remarks apply outside the narrow field of musical instruments. He is grateful for the frank discussions he has had with Russian colleagues, and he admires their efforts. Unfortunately, the problems they confront also arise among instrument collections in the United States, and he does not believe American solutions are necessarily wiser or better implemented. The core issue he wants to discuss is that of social usefulness, or put another way, the exploitation of seemingly underutilized resources, a point of contention no less crucial now than in Soviet times. When the poet Joseph Brodsky was put on trial in 1964, one of the charges against him was that his poems were not useful. Whatever this means, a utilitarian attitude remains at the heart of the situation today, as the benefits and costs of conserving historical instruments are weighed against legitimate demands to use and hear them. Usefulness, however defined, is a basic criterion of value, but competing notions of what makes instruments valuable, and to whom, remain unresolved.

First, some deep background. By the 1850s, smog had so dirtied paintings in London's National Gallery that it was proposed to move the pictures to a less polluted location, far from the city center. The objection was raised that since the basic purpose of the museum's collection was to benefit the populace, making these paintings less accessible by moving them away would undermine the intent of the gallery's founders and donors. The controversy went before High Court Justice John Taylor Coleridge, who opined:

> If it were demonstrable that the pictures in their present position must absolutely perish . . . this would conclude nothing. The existence of the pictures is not the end of the collection, but a means only to give the people an ennobling enjoyment. . . . If, while so employed, a great picture 'perished in the using' . . . it could not be said that the picture had not fulfilled the best purpose of its purchase . . . .[1]

More bluntly, in the same report of the National Gallery Site Commission, the architect and critic Digby Wyatt asserted, "that wilfully to destroy a picture would be a sin; but to neglect making use of it altogether, because the making use of it would endanger its existence . . . would be a folly."

The idea that immediate social utility trumps preservation appealed to Victorian social progressives, but the horrific losses of cultural property during World War I and the Russian Revolution undercut that altruism; and with the emergence of scientific conservation and analytics after World War II, the notion took hold in the West that, as Robert Barclay puts it, "museums exist primarily to preserve the information inherent in objects." In other words, ensuring the objects' long-term existence for study purposes is paramount. Nowadays, conservators call the shots on important aspects of collections management—or should do. Nevertheless, many fragile, structurally compromised musical instruments in Russian museums remain under pressure to work as their makers intended, unlike antique firearms, furniture, silverware, and other decorative objects that normally enjoy greater protection, divorced from their original functions.

Why musical instruments should be in an ambivalent position is obvious: They can only be fully appreciated when played and

1. Sources for quotations and further discussion appear in Libin. L. Progress, Adaptation, and the Evolution of Musical Instruments. In *Journal of the American Musical Instrument Society* XXVI (2000). 187–213.

heard, since much of their artistry is tonal. Many people even believe the myth that instruments improve with use, unlike clocks or teapots. Further, instruments are not generally regarded as works of art in their own right, but as means subservient to a higher aesthetic end, that is, music, which Herbert Spencer considered to be ". . . the highest of the fine arts . . . the one which, more than any other, ministers to human welfare." Concertgoers regularly observe rare old violins in use toward this laudable end; musicians themselves demand this, and set a precedent for the employment of instruments in museum collections. Consequently, from Victorian times to today museum-goers and administrators and the public at large have expected historic instruments to be played for the greater social good. Nowhere has this been more the case than in Russia, where only recently have instrument curators, virtually an endangered species unlike sophisticated specialists in paintings and decorative arts, been exposed to modern Western ideas of preservation.

In Soviet Russia, concert artists enjoyed privileged status, on a par with great ballet dancers. Even in Czarist times, it was not unknown for a serf musician to be emancipated and ennobled. Still today, serious musical endeavor flourishes in Russia at a level Americans could envy, considering that major orchestras like Philadelphia's are going bankrupt. Thanks to the ambition and political clout of the conductor Valery Gergiev, a performing arts complex rivaling the Lincoln Center has been constructed in St. Petersburg. How was this possible, considering Russia's dire economy? Aside from music's popular appeal, high-level performance bolsters the pride of the intelligentsia and the image of the state, and generates considerable employment and revenue, not least from tourists. Russia's musical institutions, like its museums, therefore serve a political purpose, and are heavily subsidized by the state and by oligarchs who must cough up if they want to do business, especially in Vladimir Putin's home town of St. Petersburg. Needless to say, these sometimes-reluctant donors want their money's worth, so the rather esoteric, if not elitist, advantages of preserving instruments are often outweighed by the demonstrable benefits of putting them to work, entertaining the public and earning income. What does it matter to a bureaucrat if an antique violin or piano deteriorates in use? Plenty more sit in storage waiting to be restored.

Possibly contributing to such nonchalance might be the absence of any Russian equivalents to Stradivari or Steinway; Russia doesn't produce high-quality instruments, so national pride isn't invested in them, as it is in Italy, for example. Also, the Orthodox Church has no use for instrumental music. And just as in the West, instruments—especially easy-to-come-by folk types—are generally regarded as tools, destined to be used until worn out.

Coming back to the notion of Russian fatalism, there is one instance of unintended sacrifice. The palace of Pavlovsk houses a very beautiful English piano designed by Robert Adam for Catherine the Great, with marquetry probably by Chippendale's workshop—a unique instrument from 1774 whose miraculous survival through the siege of Leningrad testifies to the devotion of the wartime staff. So when Van Cliburn visited Pavlovsk with Nixon in May 1974, it was decided to restore the 200-year-old piano so Cliburn could play it. It was restrung with modern steel wire and reinforced with big bolts. Of course it failed, to everyone's embarrassment, yet when Lord Rothschild later offered to have it brought to England for remediation, the offer was refused, since acceptance would have admitted a deficiency. In fairness, it should be mentioned that in the 1930s one of the author's predecessors at the Metropolitan Museum had the world's oldest piano rebuilt, without adequate documentation and without saving most of the removed material. Awful as this seems, had this piano not been made playable, thus allowing it to represent the potential utility of hundreds more instruments in the museum's collection, there's a good chance most of them might have been deaccessioned and dispersed after World War II.

The author does not want to give the impression of callousness on the part of Russian custodians, who have little choice in such matters; the apparatchiks decide. Curators can't count on the support of respected instrument conservators, because as far as the author knew in 2011, there were no such specialists in Russia; there are plenty of repairmen, though, whose livings depend on old instruments wearing out. During a conversation with the author Andres Segovia told a story along these lines: He was on tour in Moscow one winter when his prized guitar cracked. So the authorities rounded up a bunch of craftsmen, whom Segovia interviewed one by one. One wanted to open the crack and insert a shim, another wanted to take off the top and install a reinforcing plate, another wanted to glue and clamp the crack, which would have created stress elsewhere. Finally someone offered to fix it without clamps and without removing the top, by having his little son reach in through the sound hole and hold little cleats in place until their glue dried. And that's what he did. Segovia's point about Russian low-tech ingenuity parallels the author's observation 15 years ago that nothing works but everything can be fixed. The idea that a potentially functional instrument should be set aside for posterity and not be fixed and used is hard to fathom in hard-strapped societies that yearn for music. The author is reminded of the motto often painted on old Flemish harpsichords, *Musica dulce laborum levamen*, "sweet music lightens labor."

This isn't to say that historical instruments are everywhere under threat in Russia. Many endure intact through benign neglect. For example, the great Artillery Museum in St. Petersburg preserves many old military band instruments, but since these are incidental to the focus of the museum they mostly remain in storage, untouched. The chief exception is a proudly displayed clavichord, said to have been carried on campaigns by the 18th-century Field Marshal Mikhail Kutuzov. Actually, it's a factory-made German instrument from the 1930s, but tell that to the Marines. In fact, the armory curator knows perfectly well what is it and where it came from, but myths of state die hard. And for what it's worth, conferring legendary status on an instrument is one way to ensure its longevity.

Also practically untouched are many rare old ethnographic instruments, including some from the U.S. Northwest Coast, preserved in the Kunstkamera of Peter the Great and the Academy of Sciences. These artifacts, like other prestigious holdings amassed for the imperial collections by Russian explorers and ethnographers, have been off-limits to foreign investigators until quite recently, partly because of institutional jealousy and partly because no one knows what to do with them. Representative examples are displayed but most remain almost untouched since their acquisition in the 18th and 19th centuries. It doesn't hurt that many of these ethnic instruments and counterparts in St. Petersburg's great Museum of Ethnology are obsolete; no one knows how to play them even if they were in good enough condition. This state of limbo also holds true of archaeological treasures such as a well-preserved, ancient Altaic harp in the State Hermitage Museum. Any restoration of it would be highly speculative, and no contemporary music survives, so why bother?

The Hermitage, the crown jewel of Russian museums, in 2010 lacked amenities that are taken for granted in America, such as climate control and UV screening, but its staff strives to maintain high standards of conservation for all its collections, instruments included. This can't be said of less well-funded, less well-equipped, and well-staffed museums devoted principally to music and instruments, such as the St. Petersburg State Museum of Theatre and Music, or the remarkable center for music archaeology in Veliky Novgorod. In both these institutions, performance on instruments from the collections is central to public programming, on which attendance and funding largely depend.

The State Museum of Theatre and Music houses its extensive instrument collection in the 18th-century Sheremetev palace, which is being beautifully restored but lacks state-of-the-art security and storage systems, much less a conservation facility, photo studio, buffered vitrines, and so on. In fact a lot of the display furniture was built by the curator from materials he found or bought second-hand. He also holds two other jobs to make ends meet. The author sympathizes with his position, competing for attention and for visitors against much more visible institutions. Pressured by his former director to raise the collection's profile, he couldn't decline to use famous instruments, such as the composer Glinka's violin, if he wanted to—and as a musician himself, he gains security by presenting gallery performances.

Farther out on a limb was the late Vladimir Ivanovich Povetkin, the recently (2010) deceased head of the institute for music archaeology in Veliky Novgorod. Excavations down to the 11th-century level of Novgorod have uncovered many fragments of medieval instruments or what seem to be instruments. Povetkin was fiercely devoted to reconstructing these instruments and their music on the basis of current folk counterparts. He deserves credit for tirelessly drawing attention to the subject, but his highly opinionated, do-it-yourself approach came with a cost: Reportedly, excavated fragments were consolidated, then grafted onto reconstructed bodies, which might or might not represent original forms. Povetkin cannot be blamed because his work was done with integrity and on the basis of all the insight available to him. But if true (and this is only rumor), it precludes further analysis of those finds in their excavated condition.

As for the aforementioned Russian fatalism, this is not just a cliché. Recalling Russia's violent past, notably the siege of Leningrad, which many elders remember all too well, it is not surprising that some Communist holdovers still in authority have been pessimistic or skeptical about conservation, believing this to be a lost cause, of no obvious social or economic benefit. During the siege and later during the Stalinist terror, conservation was the last thing on most peoples' minds when their survival depended on sacrificing precious belongings or putting them to untoward uses. This situation was echoed after the fall of the Soviet Union, when social safety nets fell apart and many pensioners had to sell heirlooms to buy food. Just at such stressful times, poetry, literature, and the performing arts deliver spiritual salvation; just at such times musical instruments are most vulnerable to overuse and expedient repair.

So, economic and social insecurity foster the view that preservation is ultimately futile. This view can be exacerbated by the old Russian habit of personifying objects, regarding them as animate and mortal, hence inevitably doomed. This is not just a folkloric expression; Russian life expectancy has plummeted despite all the promised benefits of an open society. If human life is so precarious, why agonize over the fate of old instruments? "Let's at least get some pleasure out of them while we can," is the common feeling.

To their eternal credit, many curators risked their lives to save prized museum pieces during the Siege and afterwards, when many collections were looted. Their successors, deprived until recently of collegial relations with the West, may be forgiven their suspicion of interventions at this late stage, especially considering the outcome of ill-considered debacles such as the piano repair at Pavlovsk. Without professionally trained instrument conservators, and lacking treatment protocols for instrument conservation, not to mention money and facilities, bureaucratic reluctance to tackle sensitive but low-priority projects is understandable.

Nevertheless, attitudes toward instrument conservation are changing for the better. Access to specialized information through the Web has been fostered for example by ICOM's Committee for Museums and Collections of Musical Instruments, which held an international meeting in St. Petersburg in 2002. This focused local attention on the plight of the instruments and demonstrated international concern. U.S. foundation grants enabled the instruments curator at the State Museum for Theatre and Music to exchange visits with the author, and a lot of progress was made in the run-up to the 2003 celebration of St. Petersburg's tercentenary, when Putin supported a big push to upgrade museum displays and amenities.

Much of the work on the instruments was cosmetic or had to do with improving documentation and labeling, but it represented the first post-Soviet infusion of energy in the instruments field.

Another step in the right direction has been the emergence of more effective presentation strategies and access policies. The increasing availability of playable replicas of historic instruments has relieved pressure to play the originals, and as musicians increasingly demand high-quality copies, Russian craftsmen are learning the value of preserving museum pieces for study. Recordings and audio guides also help satisfy visitors' curiosity without endangering the instruments. And increased contact with the West has made Russian performers and instrument makers as well as museum professionals more aware of modern conservation principles, the usefulness of technical drawings, and so on.

In 2011, however, things did not look quite as bright as they did in the years approaching St. Petersburg's tercentenary. Political attitudes have hardened, and Russian nationalism is on the rise. With the economic downturn, funding is drying up. The author's trip in 2010 was paid for by the Likhachev Foundation, the first Russian cultural NGO to sponsor visits by Americans, as far as the author knows. How long that will last is anyone's guess. Fortunately, some rich Russian patrons sincerely appreciate the fine and performing arts and support them generously. So by these means, and with the retirement of reactionary Soviet bureaucrats, at least the seeds of a more enlightened attitude toward instrument conservation have taken root, and the chief obstacle is not so much philosophical as practical: lack of facilities, conservation materials and technical publications, training, and full-time positions. As the author indicated earlier, many Russian museum employees hold second and third jobs to make ends meet. There's clearly more money to be made from repairing instruments than from conserving and studying them, and repair practices spill over into museum work. All this affects morale; would-be conservators' prospects contrast glaringly with the esteem accorded celebrated Russian musicians, many of them trained at highly influential conservatories, which naturally emphasize use rather than preservation of fine instruments. Awakening awareness of conservation's benefits at Russia's conservatories, or for that matter at Juilliard, would go a long way toward improving prospects for historical instruments. This job requires collaboration between sympathetic musicians, educators, curators, and conservators, and it's a tall order, but no longer hopeless.

NB: Some observations and opinions expressed here are now (2015) outdated and no longer necessarily reflect the author's views.

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RIAN DEURENBERG-WILKINSON AND RANDY S. WILKINSON

Reproductions for Hamilton Grange: What Legs Do We Have to Stand on

ABSTRACT—A suite of seating furniture, owned by Alexander Hamilton and attributed to Adam Hains and George Bertault, was conserved and partly reproduced as part of two contracts for Hamilton Grange National Memorial, awarded to the private firm of Fallon & Wilkinson, LLC. The first part of this paper focuses on the reproduction challenges of the suite of side chairs, armchairs, and sofa. The second part discusses conservation of the suite including research of construction and decorative features as well as upholstery. Evidence of original under upholstery and show covers is presented and compared to similar suites in other collections.

1. INTRODUCTION

In early May 2010, Fallon & Wilkinson, LLC was awarded a contract to reproduce twenty eight pieces of Federal furniture for Hamilton Grange National Memorial (HAGR), the New York City country estate of Alexander Hamilton. Shortly thereafter, the company was awarded an additional contract to conserve a set of five chairs. This set was also part of the group of original pieces of furniture that needed to be reproduced.

This paper discusses the development of the project from photographs to actual reproductions, and how the authors' examination of the pieces for conservation helped the curator advocate successfully for additional funding and more accurate reproductions.

1.1 ALEXANDER HAMILTON

Alexander Hamilton is one of the founding fathers of the United States. He was born of an illegitimate union probably in the year 1755, in the Caribbean. He was largely self-taught, but rose quickly through the Revolutionary War to become a member of the constitutional convention, head of the Federalist Party, and the first Treasury Secretary. He had a turbulent life from his harsh upbringing, military career, clashes with other founding fathers, illicit romances, and finally to his death in 1804 in a duel with Aaron Burr, at only 49 years old.

1.2 HAMILTON GRANGE

Although Hamilton lived in many places, Hamilton Grange (fig. 1) is believed to be the only home he owned; all others were rented. Hamilton built the Grange in 1801–02, as a Federal style country house about two years before his untimely death.

The house was originally located on a wooded thirty-two-acre property in northern Manhattan. Prominent architect John McComb Jr. designed and constructed the Grange. It was an impressive building with two stories, a front entry portico, rear portico, and side piazzas that were detailed with columns and roof balustrades. The two largest interior spaces on the first floor, the parlor and the dining room, were octagonal in shape.

Following Alexander Hamilton's sudden death in 1804, his wife, Elizabeth Schuyler Hamilton, continued to own Hamilton Grange, although she did not live there fulltime. She sold the house in 1833.

During the mid- to late-19th century, it was occupied by several different owners. In 1889, the Grange was given to St. Luke's Episcopal Church by a developer who moved it to a new site on Convent Avenue, between 141st and 142nd Streets,

Fig. 1. Hamilton Grange; perspective view of south (front) and east side drawing by OH.F. Langmann (location of original unknown), before the 1889 move. (HABS NY-6335-3, http://memory.loc.gov/pnp/habshaer/ny/ny1700/ny1721/photos/119292pv.jpg)

100 yards to the southeast. Several changes were made to the front of the building at the time.

St. Luke's Church in turn sold Hamilton Grange to the American Scenic and Historic Preservation Society in 1924, which maintained and operated it as a house museum. Hamilton Grange was designated a National Historic Landmark in 1960 and a National Memorial in 1962. That same year, it was acquired by the National Park Service (NPS).

Hamilton Grange was moved a second time in 2008, one block over within St. Nicholas Park. The move was part of an NPS general management plan for the building's restoration. After the move was completed, the restoration of the exterior and interior began.

The front façade, which was altered during the first move, was restored by reinstalling the front to its original location and rebuilding the removed front porch. The previous interior alterations to the stair hall, parlor, and dining room are currently being restored to their original configurations. An exhibition plan for Hamilton Grange was developed, which included the installation of interpretive exhibits and historic furnishings.

1.3 Interpretation of the House

Unfortunately, it has proven to be very hard for the museum's interpreters to determine what pieces were used originally at the Grange. The period of interpretation is very short: only from 1802 to 1804. This is the period from Hamilton's first occupation of the house to Hamilton's death. Although there are quite a few pieces of furniture documented to have been owned by Hamilton, the lack of an estate inventory, and the family's occupation of multiple homes at the same time, has made it impossible to verify the original location of the furniture at a certain moment in time.

Hamilton's cash book suggests that the original furnishings for Hamilton Grange were likely a combination of earlier family objects and newly acquired pieces. Among the newly acquired pieces were probably a set of William Palmer painted chairs, and possibly a cylinder desk and traveling desk for the study. The parlor's Louis XVI suite of furniture was certainly purchased for the Hamilton's residence in Philadelphia, sometime after 1790.

2. REPRODUCTION CONTRACT

Most of the furniture to be reproduced (fig. 2) was known to have been in Hamilton's possession. Only the sideboard was not documented to have been owned by Hamilton. Rather, it was deemed appropriate for the period and status of the house and owner. All pieces were reproduced from actual period pieces of furniture. The side and armchairs of the Hains group of furniture were the only pieces still in the collection of Hamilton Grange; all other pieces had been dispersed to various collections (table 1).

The reproduction pieces were intended for the newly interpreted rooms on the ground floor.

Fig. 2. Clockwise: side table, shield back chair, Louis XVI sofa, Louis XVI armchairs, sideboard, writing desk, and cylinder desk.

For the parlor
- 3 Louis XVI armchairs
- 2 Louis XVI side chairs
- 1 Louis XVI sofa

For the hall
- 2 Federal side tables

For the study
- 2 writing desks
- 1 Federal cylinder desk

For the dining room
- 14 shield back side chairs
- 2 matching shield back armchairs
- 1 Federal New York sideboard

When bidding on the contracts, Fallon & Wilkinson, LLC had only seen the objects in photographs with no background information, except for a date and a short description of 10–20 words. After having been awarded both contracts, the authors were provided with the 2010 Hamilton Grange Furnishings Plan (Waite 2010), in which mention is made of the cabinetmaker and upholsterer of the Louis XVI set, similar chairs in other collections, among other information about Alexander Hamilton's purchases, and the context and style of his home, Hamilton Grange. This furnishings plan was an updated version of the 1986 furnishings plan.

Table 1. Overview of Furniture to be Reproduced for Hamilton Grange, Under This Contract

No. of Objects	Object	Material	Source	Proposed Location	Provenance	Discoveries/ Alterations
3	Armchairs, Louis XVI style, 1790–1795	Mahogany green silk	Hamilton Grange, catalog HAGR 84 or HAGR 85	Parlor	Owned by Hamilton, poss. used at HAGR later; still in collection	Upholstery incorrect; needs: -Less loft, crisper edges -large pattern silk damask -closed brass nailing -additional trim
2	Side chairs, Louis XVI style, 1790–1795	Mahogany green silk	Hamilton Grange, catalog HAGR 86, HAGR 87, or HAGR 88	Parlor	Owned by Hamilton, poss. used at HAGR later; still in collection	See armchairs
1	Sofa, Louis XVI style, 1790–1795	Mahogany green silk	MCNY, accession no. 71.31.16	Parlor	Owned by Hamilton, poss. used later at HAGR; donated to MCNY by great-grandson	See armchairs; design one sofa out of two: -top of MCNY sofa (has altered base) -base of the HNE sofa
2	Side tables, pair ca. 1800	Mahogany with satinwood inlay	SI, catalog no. 14475	Hall	Owned by Hamilton, poss. used in Philadelphia and downtown Manhattan, poss. later at HAGR; donated to SI by grandson	-Shelf supports are original -Shelves may or may not be original -Apron has drawer
2	Writing desks, traveling, ca. 1800; on desk or trunk	Mahogany	SI, catalog no. 16507	Study	Owned by Hamilton; donated to SI by grandson	
1	Cylinder desk Federal style, ca. 1800	Mahogany	MCNY, catalog no. 71.31.13	Study	Owned by Hamilton, poss. used at HAGR; donated to MCNY by grandson	
14+2	Shield back side chairs and armchairs ca. 1800	Mahogany with satinwood inlay horsehair	MMA, accession no. 1977.257.1	Dining room	Owned by Hamilton or Schuylers Hamilton; in various institutions through donations by Hamilton descendants or antique brokers	Add spaced brass nailing (none in photograph); adapt armchair from side chair
1	Sideboard, New York, ca. 1800, attributed to Elbert Anderson	Mahogany and mahogany veneer	Colonial Williamsburg collection, accession no. 1930-12	Dining room	Not documented to family, but historically appropriate	

Only one day was allotted to examine, photograph, and draw each piece on site. During examination of the furniture in the collections and at the studio, discoveries were made that showed that some of the pieces of furniture in the photographs provided with the initial request for proposal (RFP) were not historically accurate.

The set of Hains seating furniture will be highlighted in this paper, as it presented several interesting findings and challenges.

2.1 PROVENANCE OF THE HAINS SUITE

The suite was dispersed among the family upon the death of Alexander Hamilton's widow Elizabeth, in 1854.

The chairs descended in the Hamilton family until they were acquired by C. Whitney Dall, who in turn donated them to the NPS in 1979.

The NPS owns five chairs from the set: two armchairs and three side chairs. The original set included at least eight armchairs, five side chairs, and one, or possibly two, large sofa(s). A pair of demi-lune side tables may also have been part of the suite.

According to the 1986 Hamilton Grange Furnishings Report, some of the pieces are now in the following collections.

1. Two armchairs and a demi-lune side table at the Smithsonian Institution (SI).
2. One sofa, two armchairs, and two side chairs at the Museum of the City of New York (MCNY).
3. One armchair and one side chair in the collection of Hamilton descendant, Geo T. Bowdoin (no documentation).

2.2 ATTRIBUTION OF THE HAINS SUITE

The Hamiltons purchased the French-inspired Louis XVI parlor suite directly from Hains sometime between 1790 and 1795. The suite was possibly upholstered by Georges Bertault. When the US government moved from New York to Philadelphia in 1790, the Hamiltons moved with it. Philadelphia presented many possibilities for purchasing new furniture in the most current taste by the city's outstanding cabinetmakers. Adam Hains was one of such artisans and had a cabinetmaking shop on 135 North Third Street. Many pieces made by Hains were upholstered by French upholsterer George Bertault.

It appears that the suite was both fashionable and of a popular design at the time. The French style may have been inspired in part by the furnishings that Thomas Jefferson purchased in Paris in the 1780s. In fact, a suite of eighteen chairs, imported by Jefferson is very similar to the Hamiltons' parlor suite.

Hains sold at least three more sets in the same French-inspired design, additional to the Hamiltons' suite.

The first of these sets may have been made for President George Washington in 1793, which he acquired from Bertault, and which was probably made by Hains. Two of the armchairs are currently in the White House collection. The set included six chairs and two stools.

A second set is known to have been owned by Andrew Craigie, the first apothecary general in the Continental Army. Craigie purchased twelve armchairs and two settees ca. 1793 from Bertault. The suite was used at Vassall House in Cambridge, MA, built in 1791, and is now in possession of the NPS as the Vassall-Craigie-Longfellow House.

The third set was also used in Massachusetts, at Theodore Lyman's country residence, "The Vale," in Waltham, MA, which was built in 1793 and is currently managed by Historic New England (HNE). Lyman purchased eight armchairs and two settees from Adam Hains, of which one chair retains a paper label with the text:

> *All Kinds of*
> *Cabinet and Chair work*
> *Done By*
> *Adam Hains*
> *No. 135 North Third Street*
> *Philadelphia* (Carlisle 2003)

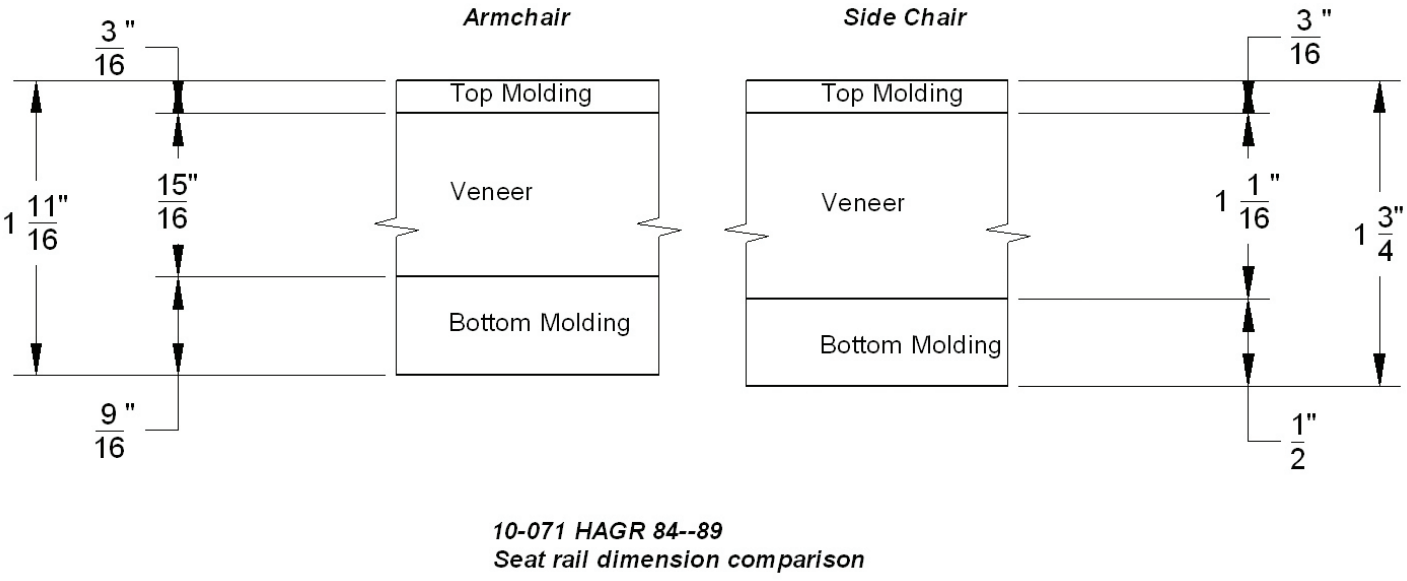

Fig. 3. Drawing to compare the layout of the seat rails on an armchair (left) and side chair (right).

Fig. 4. Top: rosette carvings on armchair HAGR 85 (left) and side chair HAGR 89 (right); Bottom: finials on armchair HAGR 85 (left) and side chair HAGR 89 (right).

2.3 Reproduction of side and armchairs

The chairs are complicated pieces of furniture due to compound angles, round shapes, and a multitude of techniques employed in them. They are veneered and include moldings, regular and off-center turnings, carving, and French style upholstery.

It was fortunate to have the chairs in the studio for conservation as well as reproduction, as it provided full access to all minute details at any point.

The chairs are made with ash secondary wood for the seat rails and mahogany for all show surfaces, including the veneer. They are joined by mortise and tenon joints (pegged in the rear panel of the armchairs), and sliding dovetail joints for the arm supports.

2.3.1 Comparison of Hamilton Grange side chairs and armchairs

The side and armchairs have numerous variances in design, indicating that they may not have belonged to the same set originally. However, there are many similarities that suggest that they were made in the same cabinetmaker's shop. The following is a list of the most obvious differences.

Fig. 5. Detail of the turned front legs of armchair HAGR 85 (left) and side chair HAGR 89 (right).

1. The composition of the seat rail decoration uses the same vocabulary as far as top fillet, cross-banded veneer, and bottom molding are concerned, but the dimensions of the individual elements and overall height vary between the arm and side chairs. For instance, the veneered section is lower on the armchairs (fig. 3).
2. The rosette carving on the armchair is a more classically carved rosette, while the style of the rosette on the side chair is reminiscent of chip carving (fig. 4).
3. The finials of the armchairs feature eight narrow petals, while the finials of the side chairs have four wide leaves (fig. 4).
4. The main differences between the turned legs are (fig. 5):
   (a) a single collar on the armchairs, a double collar at the top and bottom of the side chairs;
   (b) a longer flat above the fluting on the armchairs than on the side chairs;
   (c) a scoop in the top of the stops of the stop fluting of the armchairs, no scoop in the stops of the side chairs; and
   (d) the stop flutes die into the bottom collar on the armchairs, while the flutes end in a carved U shape on the side chairs.
5. The armchairs have through pegs in the mortise and tenon joints of the rear legs with the seat rails, the stay rail, the arms, and the crest rail, while they are not visible (or not used) on the side chairs.
6. The inside of the seat rails of the armchairs is somewhat finished/smoothed, while the inside of the seat rails on the side chairs is still rough sawn.

7. The top fillet of the seat rails on the armchairs is constructed with a solid piece of wood at least two or three times as thick as the piece of veneer employed on the side chairs (ca. 1/16 in. thick).
8. The bottom molding of the armchairs is not secured to the seat rails with square nails, while it is on the side chairs.

Comparing the Hamilton Grange chairs to chairs and sofas attributed to Hains in the other collections that were visited, it becomes apparent that the Hamilton Grange armchairs stand out (table 2). The rosette, arm knuckle, and finial carvings, layout of the seat rail decoration and joinery, only seem to match the armchairs at the MCNY, which have a Hamilton provenance, and are closely related to the Craigie chairs at the Vassall-Craigie-Longfellow House. The chairs and sofas in the collections of the Metropolitan Museum of Art (MMA), HNE (Lyman suite), White House, and the Museum of Fine Arts (MFA), Boston, appear to match the Hamilton Grange side chairs, with some differences.

2.3.2 Reproduction process of the chairs

The reproduction process started with a detailed drawing of the seat plan, and layout of the turning of the front and rear legs. Since there were many dimensional differences between each of the three side chairs and both of the armchairs, it was decided to take one chair of each type as the basis for reproduction. The side chair was slightly asymmetrical, which provided a bit of additional challenge.

The layout of the rear leg was rather complicated because of its compound angles, double rake, round shapes, and limited accessibility with the upholstery. They also featured a big off-center turning of about 15 in. diameter. Because the rear stiles sat at an angle within the seat plan and had a double rake for the legs as well as the upper stiles, the rear seat rail, stay rail, and crest rail all entered the rear stiles at a different (compound) angle. It was very important to get both rakes of the rear stiles and the angle within the seat plan exactly right. If any of the angles were off, the width of the crest rail and stay rail, length of the arms, and splay of the legs would not be correct (fig. 6).

Most of the carving on the chairs was fairly straightforward, although time consuming, and included stop fluting in the turned front legs, rosette carvings of two types, fluting in the rear stiles, stay rail, and crest rail, and turned and carved finials. The arms, however, did pose an interesting carving challenge, being very three-dimensional with a double curve going up and out. All four arms on the two original armchairs proved to be slightly to significantly different. A drawing of the top and side was made and blanks were cut out. After a complicated fitting of the two joints, the arms were slowly carved to shape using patterns of the curves and arm pads. Final carving and fluting was done after assembly with the rest of the chair.

2.4 REPRODUCTION OF THE SOFA

The reproduction of the sofa was a challenge of different proportions. The sofa that was thought to have been at Hamilton Grange originally, is now in the collection of the MCNY. It was severely altered in the 19th century, when all the legs were taken off and an Empire style base with crotch mahogany was put on it (fig. 7). The initial RFP asked to "modify base to approximate sofa's original structure based on comparison with matching side and armchairs in collection at Hamilton Grange." This proved to be less straightforward than the RFP suggested.

Fig. 6. The rear panel of one of the reproduction armchairs before assembly.

Fortunately, when visiting HNE to examine a recently reupholstered Hains armchair, there was the possibility to briefly inspect one of the two Hains sofas that are part of the Lyman suite. One of them had open arms with arm pads like the Hains armchairs, but the other one was very similar to Hamilton's sofa and had closed arms (fig. 7). Two major differences with Hamilton's sofa were the presence of only one medial stile and one rear leg in the back, and the contoured bottom of the crest rail of the HNE sofa. The Hamilton sofa had two medial stiles and possibly had two rear legs originally. It had a straight bottom edge on the crest rail. Additionally, there were several minor differences in the carving and upholstery details. The dimensions of both sofas were very close.

Table 2. Comparison of Cabinetwork on Examined Chairs and Sofas

	HAGR Side Chair	HAGR Armchair	MMA Armchair 1995.482	MFA Armchair 1979.486-487	MCNY Side Chair 71.13.14A	MCNY Armchair 71.31.14B	MCNY Sofa 71.31.16	HNE Armchairs 1966.121 1966.124	HNE Sofa 1966.116	Washington Armchair	Craigie Armchair
Rosette carving	"Chip"	Classical	"Chip"	"Chip"	"Chip"	Classical	N/A	"Chip"	"Chip"	"Chip"	Classical
Turned legs	Double collar bottom and top	Scoop in stops of flutes; no double collar	Double collar	Double collar	Double collar	Scoop; no double collar	N/A	Double collar	Double collar (diff. dim.)	Double collar	Scoop; no double collar?
Joinery	No through pegs visible	Through pegs in mortise and tenon of rear legs	No?	?	?	Through pegs	?	No	?	?	?
Inside of seat rails	Rough sawn	Smooth	Rough	?	?	Somewhat cleaned up	?	Rough	?	?	?
Finials	Leaves (also differences between chairs)	Petals	Leaves	Leaves	Leaves	Petals	Petals	Leaves	Leaves	Different	Petals?
Top fillet of seat rails	1/16 in. thick	1/8–3/16 in. thick, kerfed	?	?	?	?	N/A	?	?	?	?
Bottom molding of seat rails	Attached with square nails	No nails	No nails?	?	?	?	N/A	?	?	?	?
Seat rail decorative layout	Taller veneer	Lower veneer	Taller?	Taller	Taller	Lower	N/A	Taller	Taller	Taller	Lower
Volute on knuckle	Single twist	Single	Double twist	Double twist	Single	Single	Single	Double	Double	Double	Single?
Miscellaneous							Note 1	Note 2	Note 3		

Note 1: same molding as chairs at seat-arm support; diff. molding (flat) at arm support-arm; one medial stile, one rear leg.

Note 2: different molding at seat-arm support; arms lower than HAGR armchair.

Note 3: two medial stiles in back, probably two rear legs.

Fig. 7. Top: sofa at HNE. Gift of the children of Arthur and Susan Cabot Lyman. Accession #1966.116.1. Photograph by Randy S. Wilkinson. Courtesy of HNE; Bottom: sofa at the MCNY. Accession #71.31.16. Photograph by Randy S. Wilkinson. Courtesy of the MCNY.

For the new reproduction sofa, the layout of the Hamilton sofa was used from the seat rail up, and the design of the HNE sofa was applied to the legs, which matched the legs of the side chairs. The design of the squab and cushions was based on an image in Edward S. Cooke's book, *Upholstery in America & Europe from the Seventeenth Century to World War I* (1987), of the French sofa in the Rijksmuseum, Amsterdam.

3. CONSERVATION CONTRACT

As mentioned earlier, Fallon & Wilkinson, LLC was also awarded a contract to conserve the five original Hains chairs in the Hamilton Grange collection.

3.1 TREATMENT

The conservation of the chair frames proved to be very minor, and was limited to

1. stabilization of occasional breaks, loose veneer, rosette carvings, finials, and moldings;
2. injecting of some joints for structural stability;
3. loss compensation on tacking blocks and tacking rails with match-stick technique in poplar;
4. consolidation of tacking rails with fish glue or Lascaux medium for consolidation; and
5. touch up of regular wear and—to an extent—fill tack holes in the show wood of the back.

However, the upholstery examination and reupholstery of the original chairs was quite involved.

3.2 UPHOLSTERY EXAMINATION

As requested in the scope of work, recommendations were made for (re-)upholstery of both the original chairs and the reproduction chairs. The later show covers on the chairs were carefully removed to evaluate the foundation and look for evidence of an original show cover and under-upholstery.

No mention or documentation of the original upholstery existed in the NPS accession files, except for a photograph of unknown date from a 1968 book on the Grange (Sloane and Anthony, 1968), which depicts a side chair and an armchair, supposedly retaining their original under-upholstery with a new show cover. Unfortunately, the photograph is in black and white and the caption does not mention a color. The chairs appear to be upholstered in a plain fabric and have a crisper shape with trim and brass nailing in the French manner.

Soon after the start of the upholstery examination on the chairs, it was discovered that they were not upholstered quite right. There was too much loft in the seat and the back, where the shape needed to be more crisp and box-like in the French manner. The back should have come straight out from the crest rail and rear stiles, leaving room for brass decorative nailing. The back should have followed the curve of the crest rail all along its height, and follow the straightness of the rear stiles, with no added loft in either direction. The seat should have come straight up on all sides and be extremely flat on the top ("en tableau"), with no loft. All corners should have been very crisp and square. Typically, there should have been brass nailing and trim around the base of the arm supports and even on part of the show wood of the arm support.

The chairs currently featured no brass nails and only trim around the perimeter of the seat, back, and arm pads (fig. 8).

3.2.1 Under-upholstery

Part of the (likely) original under-upholstery was discovered hidden inside the current under-upholstery on seat, back, and arms. The added material looked like a fairly recent treatment, as the fabrics were bright, unstained, and in excellent condition. The tacks used were modern tacks.

The old/original horsehair "cake," found inside the later treatment, was in fair to good condition. A very crisp stitched edge and sparing use of tacks were clearly visible on both the back and seat. The upholstery cake of the back appeared to have a beveled, rather than square edge at the bottom. One upholstery conservator (having seen it in images) believed that it was the original cake, based on the examples of Hains chairs she had seen at HNE and the MMA among others. Some of the chairs (armchair HAGR 84 and side chairs 88, 89) had an old addition to the original cake in the form of some added horsehair and another stitched cover, which was stitched through all layers. The two other chairs (armchair HAGR 85 and side chair HAGR 87)

Fig. 8. Hamilton Grange armchair (HAGR 84) before treatment (left) and the recently reupholstered Lyman armchair (right). Gift of the children of Arthur and Susan Cabot Lyman. Accession #1966.121. Photograph by Peter Harholdt. Courtesy of HNE. Adam Hains (1768–after 1820). Original upholstery attributed to George Bertault (working 1792–1800). Philadelphia, PA, 1797. Mahogany, ash. H. 33 ¼, W. 23 ¼, D. 19 ¼.

appeared not to have these older added materials, but only the newer additions. Some of the old cakes were cut open during a previous restoration to adjust or remove the horsehair.

Like Hamilton's chairs, the Hains chairs at HNE retained their original under-upholstery, which was a testament to the quality of the upholsterer's work. However, the very typical top stitching of the seat's cake, the so-called French edge, was removed to soften the edge. Hamilton Grange's chairs retained this valuable information, which so powerfully defined the square, sharp shape of the seat.

3.2.2 Show cover

Generally, green seemed to be the fabric of choice in 1790 for these chairs, judging by the original purchasers and intended locations.

1. President Washington's chairs were placed in the green drawing room.
2. The Craigie suite was covered in green and white silk.
3. The Lyman furniture revealed green silk damask under some of the original tacks when it was recently conserved for display.
4. The MMA chair had fragments of yellow silk in all of the tacking margins. It is now upholstered in red silk by curatorial choice.

Also, Hamilton's chairs were re-covered in green fabric, possibly shortly after they were acquired in 1979, although no justification for this color is documented.

Upon seeking advice from several upholstery consultants and conservators, it was found out that the show cover should be silk damask with a large repeat, rather than the current small pattern silk.

3.2.3 Show cover of the outbacks

Although the chairs most recently had an outback applied to the front of the rear stiles, it was clear that the outback was once applied to the back of the rear stiles, given the extensive number

Fig. 9. Back of Hamilton Grange side chair (HAGR 87) with filled tack holes from previous outback attachment.

of filled tack holes (fig. 9). With the bottom of the crest rail being rather crudely finished, but the rear stiles and stay rail finely finished, no conclusive evidence could be found on the Hamilton Grange chairs alone.

Upon comparing the application on chairs in other collections, it was concluded that all chairs, except the MMA chair, had had the outback applied to the back of the rear stiles at some point in their life (table 3). The HNE Lyman chairs show the outback applied to the back of the rear stiles on an 1884 black and white photograph.

However, there is evidence of an old if not original application to the front of the stiles on the MMA chair, which shows no other evidence at all. The underside of the MMA chair's crest rail is finished. Also, the HNE Lyman chairs had show fabric applied to the front of the rear stiles.

All current outbacks are applied to the front of the stiles, except the outback of the MCNY sofa which maintains an older upholstery campaign, and the HNE sofa which does not currently have a show cover.

The other aspect of the outback was the material of choice. The Lyman suite retained its original French style under-upholstery, although the show covers were replaced in the 19th century. One chair retained a blue check linen underneath the cream colored silk outback. Checked linen was sometimes used by French upholsterers for the visible sack cloth of the outback and was also employed on Jefferson's Monticello chairs in a red check. It did not appear to have been the visible sack cloth for the outback on the Lyman suite, however. The MMA chair currently features the same large pattern red silk damask for the outback as for the rest of the chair, while the MCNY chairs have a cream colored fabric for the outback and a blue-grey floral striped silk for the rest of the chair.

Since all chairs currently had the outback applied to the front of the rear stiles and the material of choice mostly appeared to have been silk, it was recommended that the outback be applied in silk to the front of the rear stiles for the Hamilton Grange chairs as well. Having been able to compare chairs in four different institutions justified the more expensive choice of silk over (checked) linen.

During examination, three single blue threads were found attached with some brittle glue on the back of the old horsehair cake of the back rest of two side chairs. Cathy J. Coho, upholstery conservator in private practice, performed preliminary fiber identification on the threads and classified them as Z-spun linen fibers, with traces of blue dye. It is possible that they were part of a loosely woven linen fabric, perhaps a blue check similar to what was found on the Lyman chairs at HNE. Another possibility was that the fibers were part of a plied upholstery sewing thread that was over-dyed blue after it was spun. Similar sewing threads from previous repairs were also found on the Lyman chairs. Given its location, no firm conclusions could be drawn.

3.2.4 Brass nailing and trim

The undated photograph in *Mr. Daniels and the Grange* (Sloane and Anthony, 1968) depicted a side chair and armchair, supposedly retaining their original under-upholstery. As on the restored Lyman chairs, these two chairs featured closed brass nailing and trim outlining the raised edge of the inback and seat covers. The Hamilton sofa now at the MCNY appeared to have had the same decorative scheme.

During examination of the armchairs, two brass square shanks were found at $\frac{7}{16}$ in. apart, confirming the closed nailing pattern for the brass decorative nailing, as seen in the black and white image. In addition, some of the brass dome heads left an impression in the show wood of the armrests, just above the seat on the outside, which appeared to be characteristic for the upholstery on other Hains chairs. There again, they were close to each other. Their diameter was about $\frac{15}{32}$ in.

The style and quality of the old upholstery cake and the application of brass decorative nails and trim on the show wood of the arm supports possibly link all chairs to the same upholstery shop.

3.3 Upholstery conclusions

Initially it was assumed that little evidence of the original upholstery would be found and the under-upholstery on the

Table 3. Comparison of Upholstery on Examined Chairs and Sofas

	HAGR Side Chair	**HAGR Armchair**	**MMA Armchair 1995.482**	**MFA Armchair 1979.486-487**	**MCNY Side Chair 71.13.14A**	**MCNY Armchair 71.31.14B**	**MCNY Sofa 71.31.16**	**HNE Armchairs 1966.121 1966.124**	**HNE Sofa 1966.116**	**Washington Armchair**	**Craigie Armchair**
Current location of outback	Inside	Inside	Inside	Inside	Inside	Inside	Outside	Inside (old/ original)	Inside (old/ original)	?	?
Previous location of outback	Outside (filled holes)	Outside (filled holes)	none	?	Outside (filled holes in stiles and stay rail; not in crest)	Outside ?	?	Outside (filled holes)	Outside (filled holes)	?	?
Original show cover	?	?	Yellow silk?	?	?	?	?	Green silk damask	Green silk damask	Green	Green and white silk
Current show cover	Dark green large pattern floral silk	Dark green large pattern floral silk	Red large pattern floral silk	Blue small pattern silk	Blue-grey striped floral silk	Blue-grey striped floral silk	Plain blue-grey fabric	Light green large pattern floral silk	None	Striped cream silk (?)	Cream and floral fabric
Current material of outback	Dark green large pattern floral silk	Dark green large pattern floral silk	Red large pattern floral silk	?	Plain cream cotton	Plain cream cotton	Plain beige cotton?	Old/original cream colored silk (on 1966. 124 over blue checked linen)	Coarse linen, but poss. previously covered on outside	?	?
Miscellaneous			Square bottom inback		Separately stored old cake (same as curr. on sofa)	See MCNY side chair		Chamfered bottom in back			

original chairs would not be retained. Having found abundant evidence of the correct shape, loft, and recommendations for the historically accurate type of show cover, the original scope of work was insufficient. It was no longer ethically or aesthetically advisable to simply recover the original chairs or remove the old cakes and make the reproduction chairs and sofa match them. Furthermore, due to numerous upholstery campaigns, the seat rails were in rather tough condition for traditional upholstery.

Fortunately, the curator agreed with the presented evidence and suggestions, and was able to apply successfully for additional funding and revise the RFP. The revised scope of work now included saving the old/original under-upholstery and using minimally intrusive attachment techniques with Nomex sewing strips, rather than reupholstering with traditional tacking. Materials that were added to the original foundation were removed. A historically accurate show cover of 100% silk damask with a large repeat was custom woven in England by the Gainsborough Silk Weaving Company Ltd.

The reproduction chairs were traditionally upholstered to match the original chairs.

In keeping with the French style, closed decorative brass nailing and tape in the same color as the fabric was applied all along the perimeter of the armpads, seat, and back. The trim and nails went in around the base of the armrests on the front and the side, as was done on the Hains chairs at the MMA and HNE. Trim was also stitched to the square edge of the seat and back.

Since no conclusive contradictory evidence was found on the Hamilton Grange chairs, the NPS chose green as the color for the original and reproduction chairs.

4. CONCLUSION: ETHOS, LOGOS, AND PATHOS

In both contracts, recommendations for upholstery were requested upon examination of the original, to-be-reproduced furniture. The recommendations for the entire suite of chairs and sofa were formulated based on the examination of the Hamilton Grange chairs, the MCNY sofa, the HNE sofa, (almost) identical Hains chairs in other collections, as well as conversations with upholstery experts in the field, historical evidence of upholstery practices of the period, and Alexander Hamilton's presumed taste and style. Close examination of the upholstery during conservation led to a more accurate upholstery of the originals as well as the reproductions.

The chairs are historically important, not only because they were owned by a founding father, but also because the Hains chairs are well-documented chairs in other collections. It is fairly unique that both woodwork and upholstery are attributed to the original craftsmen (i.e. Hains as the cabinetmaker and Bertault as the upholsterer). Making five more chairs to fill out the set means that Hamilton Grange will be able to display a more historically accurate presentation of what the parlor may have looked like in the period. It offers a more complete picture of the use of such furniture.

Although it is sad to know that most of the original pieces, except for the original Hains chairs, will remain in storage and out of sight, the original pieces are still available for study in other locations and collections. Because they do not need to be displayed, the originals are in some cases left in a more accessible and untouched state, i.e. not refinished or reupholstered.

The combination of both contracts (one for reproduction and one for conservation of the original chairs) proved to be a fortunate one. It provided the opportunity to study the frames in detail with a conservator's eye for historical evidence and detail. In addition, it allowed consultation with colleagues in the upholstery field for detailed, specialist information on shape, loft, and fabric choice. Upholstered as well as un-upholstered (almost) identical Hains chairs were examined in the collections of the MMA, the MCNY, and HNE.

Through the building process, insights were gained into the construction and woodworking that one cannot gain by only studying the pieces. Laying out and making components like the rear stiles and arms of the Hains armchairs was a test of one's ability to accurately measure and interpret the available evidence as well as a test of hand skills (fig. 10).

Fig. 10. An original armchair (left) and a reproduction armchair (right) during reproduction, side by side.

Fig. 11. Original side and armchair (left) and a reproduction side chair (right), after treatment.

Having been able to study some of the original pieces in depth in the studio and others on site at their various home institutions, the authors feel confident that the reproductions are as close to the originals as they can be. Often reproductions have to be made from photographs and many details cannot be determined, resulting in a reinterpretation rather than a one-on-one reproduction. These reproductions match the originals extremely closely—if not exactly—in dimensions and execution, ensuring that a minimum of information is lost by exhibiting of reproductions rather than originals (fig. 11).

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KATHY Z. GILLIS

A Tale of Two Sofas

ABSTRACT—Two sofas by John Henry Belter at the VMFA came to conservation for discussion about possible treatment. At the very minimum, the gilding needed extensive cleaning, as there had been regilding, touch-ups and even bronze paint campaigns over the years. The appropriateness of the upholstery was also under examination. After research, testing, and consultation with specialists, it was decided to remove the gilding from one of these sofas. The considerations that led to a different treatment for each sofa and the decision to carry out one irreversible treatment involved ethical, educational, and artistic intent issues that were not undertaken lightly.

This is the tale of two sofas. They very likely began their lives in the middle of the 19th century in the shop of John Henry Belter, premier cabinetmaker in New York City at that time. Belter was a German immigrant who is best known for developing a method of manipulating plied woods by gluing, steaming, and bending them into dynamic curves and then applying mechanized carving techniques to bring out color variation in the layers of wood to an effect that was not only attractive, but copied by other cabinet makers of the time. The concave chair and sofa backs were pierced and cut with intricate carving. The high-relief carving cut through the layers and provided a variation in color of the wood as each layer was revealed.

The sofas considered here are attributed to Belter based on the elaborate carving and their resemblance to other sofas connected to Belter's work. When these sofas entered the Virginia Museum of Fine Arts collection in 1954, there was one major difference between them and the other known examples—they were gilded (fig. 1).

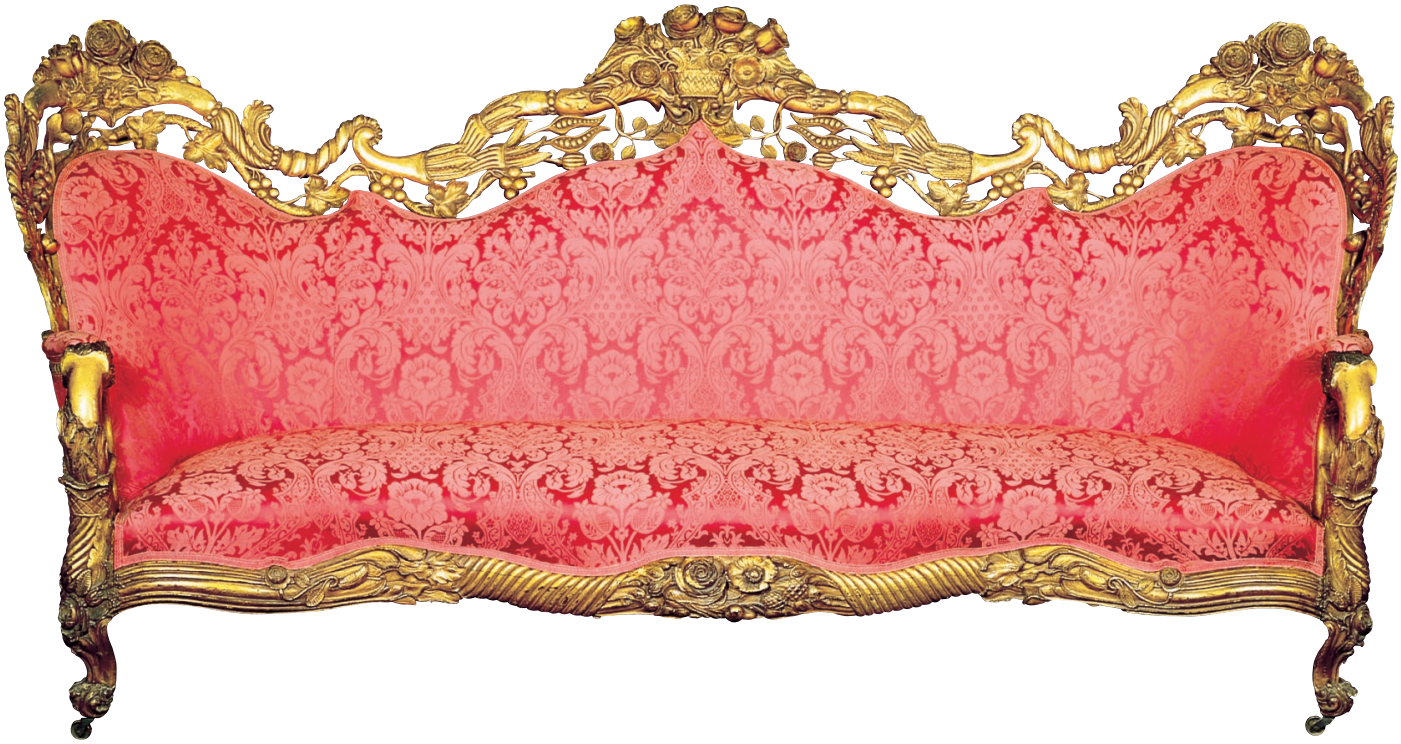


Fig. 1. Sofa, ca. 1850. Accession #54.15.2/2.
Laminated, carved, and gilded rosewood; reproduction silk damask upholstery; 43 x 94 x 36 1/2 in.; gift of Mrs. Hamilton Farnham Morrison in memory of her parents, Robert Letcher Moore and Josephine Landes Moore. Photo: Katherine Wetzel ©VMFA

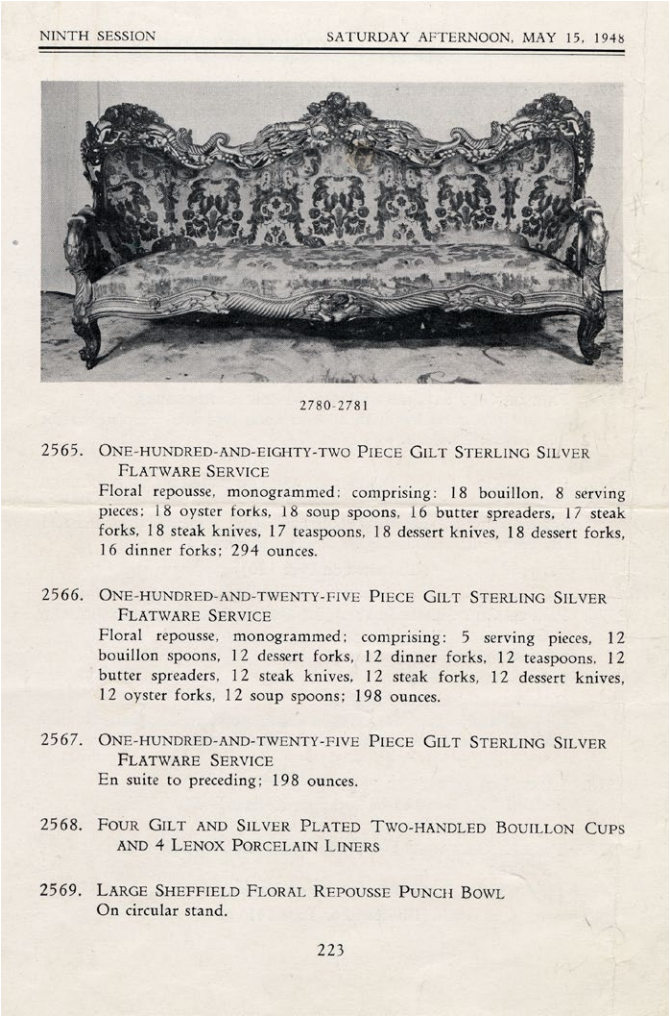
Although they may have come to life in the same workshop, they did not begin life as "a pair". There are some subtle, but important differences between them that belie them as not being "en suite" or of the same design. They have been together and referred to as "a pair", however, at least since 1907. In that year, they were photographed by the noted photographer, Frances Benjamin Johnson, at the residence of John Roll McLean (fig. 2). Born in 1848 in Cincinnati, Ohio, McLean was a newspaper magnate who ran the Cincinnati Enquirer, and after marrying a young lady from Washington, D.C., relocated to that city and eventually became the owner of the Washington Post.

The lavish architectural setting pictured is the work of John Russell Pope, made for John McLean as his "in town" house for entertaining. It was described as a place "strictly for social affairs", contained art and artifacts from Europe, and records indicate that John McLean requested his architect that while the exterior was forbidding it would "dazzle on the interior". The house (now destroyed) was located at 1500 I Street in Georgetown.

John died in 1916, and the residence was inherited by his son, Edward, who had married Evalyn Walsh in 1907. Evalyn Walsh McLean is famous for being one of the owners of the Hope Diamond, given to her by Edward. Some people believe that the rock was cursed because it seemed to bring incredibly bad luck to its owners. For Edward and Evalyn, this seems true. They divorced in 1931, they lost Georgetown house in 1932, Edward bankrupted the Washington Post in 1933, their eldest son died at the age of 8 in an automobile accident, and their daughter died of an overdose of sleeping pills (supposedly accidental) in 1941.

Evalyn died in 1947, and the next year her estate was sold at auction. The auction included both gilded sofas from the 1907 photographs, one of which was illustrated in the auction catalog (fig. 3). The catalog entries identify the sofas as being by Belter

Fig. 2. McLean Parlor, Frances Benjamin Johnson 1907.



NINTH SESSION SATURDAY AFTERNOON, MAY 15, 1948

2780-2781

2565. ONE-HUNDRED-AND-EIGHTY-TWO PIECE GILT STERLING SILVER FLATWARE SERVICE
Floral repousse, monogrammed: comprising: 18 bouillon, 8 serving pieces; 18 oyster forks, 18 soup spoons, 16 butter spreaders, 17 steak forks, 18 steak knives, 17 teaspoons, 18 dessert knives, 18 dessert forks, 16 dinner forks; 294 ounces.

2566. ONE-HUNDRED-AND-TWENTY-FIVE PIECE GILT STERLING SILVER FLATWARE SERVICE
Floral repousse, monogrammed; comprising: 5 serving pieces, 12 bouillon spoons, 12 dessert forks, 12 dinner forks, 12 teaspoons, 12 butter spreaders, 12 steak knives, 12 steak forks, 12 dessert knives, 12 oyster forks, 12 soup spoons; 198 ounces.

2567. ONE-HUNDRED-AND-TWENTY-FIVE PIECE GILT STERLING SILVER FLATWARE SERVICE
En suite to preceding; 198 ounces.

2568. FOUR GILT AND SILVER PLATED TWO-HANDLED BOUILLON CUPS AND 4 LENOX PORCELAIN LINERS

2569. LARGE SHEFFIELD FLORAL REPOUSSE PUNCH BOWL
On circular stand.

223

Fig. 3. Auction Catalog, Saturday, May 15, 1948.
Sale of the Estates of Evalyn Walsh McLean and J. R. McLean
Friendship House, Wisconsin and R Streets, Georgetown, D.C.

and one is described as a "[r]are specimen of furniture depicting sinuous rolled framework and naturalistic floral fretwork, upholstered in floral cut velvet; covering as is, frame slightly chipped". The second is described as "en suite" to preceding.

The upholstery shown in the auction catalog photo is different from that of the 1907 photographs, so it is reasonable to assume that this was at least the second campaign of upholstery, but more likely it is the third. (Whenever the sofas were gilded, a way to "update" them, it is likely that they were also reupholstered, so the 1907 photograph likely shows at least a second campaign of upholstery.)

The variations in the carving demonstrate that they are not "en suite", as one carries a design documented in other sofas attributed to Belter that is referred to as "arabasket", incorporating a basket of flowers in the center of the crest rail surrounded by arabesques of carving and the other has just a bouquet of flowers without a basket. The elements referred to as the

Fig. 4. 54.15.1/2 Laminated, carved, and gilded rosewood; 43 x 94 x 36 1/2 in.; gift of Mrs. Hamilton Farnham Morrison in memory of her parents, Robert Letcher Moore and Josephine Landes Moore. Photo: Katherine Wetzel ©VMFA

"cornucopia" also have differences: alternating concave and convex sections in the arabasket design and consistent convex sections in the other. The selection of floral and fruit species at the bottom rail is different in each. Similarities, however, are evident in the leaves, branches, and clusters of berries.

In 1954, the pair entered the collection of the Virginia Museum of Fine Arts, a gift of Mrs. Hamilton Farnham Morrison, in memory of her parents, Robert Lechter Moore and Josephine Landes Moore. The distinct variations are more apparent in photographs taken at that time (figs. 1, 4). According to her great grand-niece, it is likely "Aunt Polly" bought the sofas at the 1948 auction.

They arrived at the museum with no show cover upholstery, and while we do not know how long Mrs. Morrison may have had them (the niece does not even remember them in Aunt Polly's house, just field trips to the museum to see them), she may have had them reupholstered as well.

In 1954, the museum had them reupholstered in "Sopheid damask" which appears to be the campaign shown in this image (fig. 5).

Also, the museum's records indicate that they were given to the museum to be used as seating furniture in the galleries in which one could sit to enjoy the paintings.

In 1975, a new fabric (the Scalamandre Lorraine Pattern no. 1045 in "Raspberry") was chosen by an unnamed designer, claiming it to be the "most characteristic of its period". So here they were when brought to conservation for treatment in 1997, gold and raspberry, heralded as the only existing examples of gilded Belter furniture (Mooz and Weekley 1978). Since there is no evidence to suggest that Belter ever gilded his furniture and since they are constructed of rosewood (a very expensive wood used primarily to show off the figure of

Fig. 5. At VMFA, American Galleries, 1955.

the wood), it seems highly unlikely that they were gilded when they left Belter's workshop. But when were they gilded and by whom?

One possibility is that John McLean may have had them gilded as he decorated the "dazzling" interior of his Georgetown home. That certainly would have made them fit in better with the French furnishings also in the room. The sofas themselves provide us with sufficient (or convincing) evidence that the gilding came later. Broken petals show gilding applied to the broken or worn edges throughout both sofas. It was obviously applied after such damage had occurred (fig. 6).

Samples were taken from both sofas for microscopy to help determine a finish history for the surfaces. There were areas of oil gilding and water gilding present on the sofas, and samples were taken from multiple sites to capture the various layers of history. In the water gilded areas, gold leaf was applied over a grey bole over several layers of gesso. In oil gilded areas, gold leaf was applied over an oil resin varnish and oil was present in the pores of the wood. Results were consistent throughout on both sofas (fig. 7). The microscopy indicated that oil had been applied to the wood initially and then a resin varnish, which was undoubtedly intended as a finish coat.

So what were we to do with this information? At minimum, we wanted to clean the surfaces of the sofas, as they were both quite dirty. But we also were confronted with the fact that we had a pair of Belter sofas, neither of which represented the

Fig. 6. Detail from 54.15.2. Photo: Talitha Daddona ©VMFA

original intent of the artist. What made them "Belter" (beautiful laminated rosewood with elaborate, detailed carving) was hidden under gilding. But we did have two of them, which allowed us the luxury of pursuing two options: returning one to the way it was intended by Belter and keeping one with all the stages of the life it had experienced preserved.

After much consideration and much discussion with curators, furniture conservators, and gilding conservators, the consensus was reached to clean the gold surfaces of one of the sofas (the one with the most gold intact and least overpainting) and remove the gilding from the second. The latter was a non-reversible treatment and a drastic intervention. Even though the gilded surfaces did not represent artist's intent, the gilding campaign took place during the life of the object and was not likely done with an intent to deceive. Their appearance in the McLean household among French rococo furnishings may suggest that the decision to gild them was an attempt to update their appearance and to match the rest of the décor in the lavish, gilded age room. While all the evidence allowed all discussants to agree that the gilding was not original, it was still an important chapter in the life of the sofas. Had we not had two sofas in our collection that appeared to have duplicate finish history, we would probably not have made the same decision.

The "arabasket" design was chosen as the sofa to retain its gilding. Although dirty, the gilding on this sofa was in better condition. We removed overpaint; in some areas it was bronze paint and in others (on the ends of the armrests) an acrylic paint had been completely applied over the whole arm, including covering remnants of the "original" gilding campaign (not to be confused with the original finish coat of the sofas). Due to

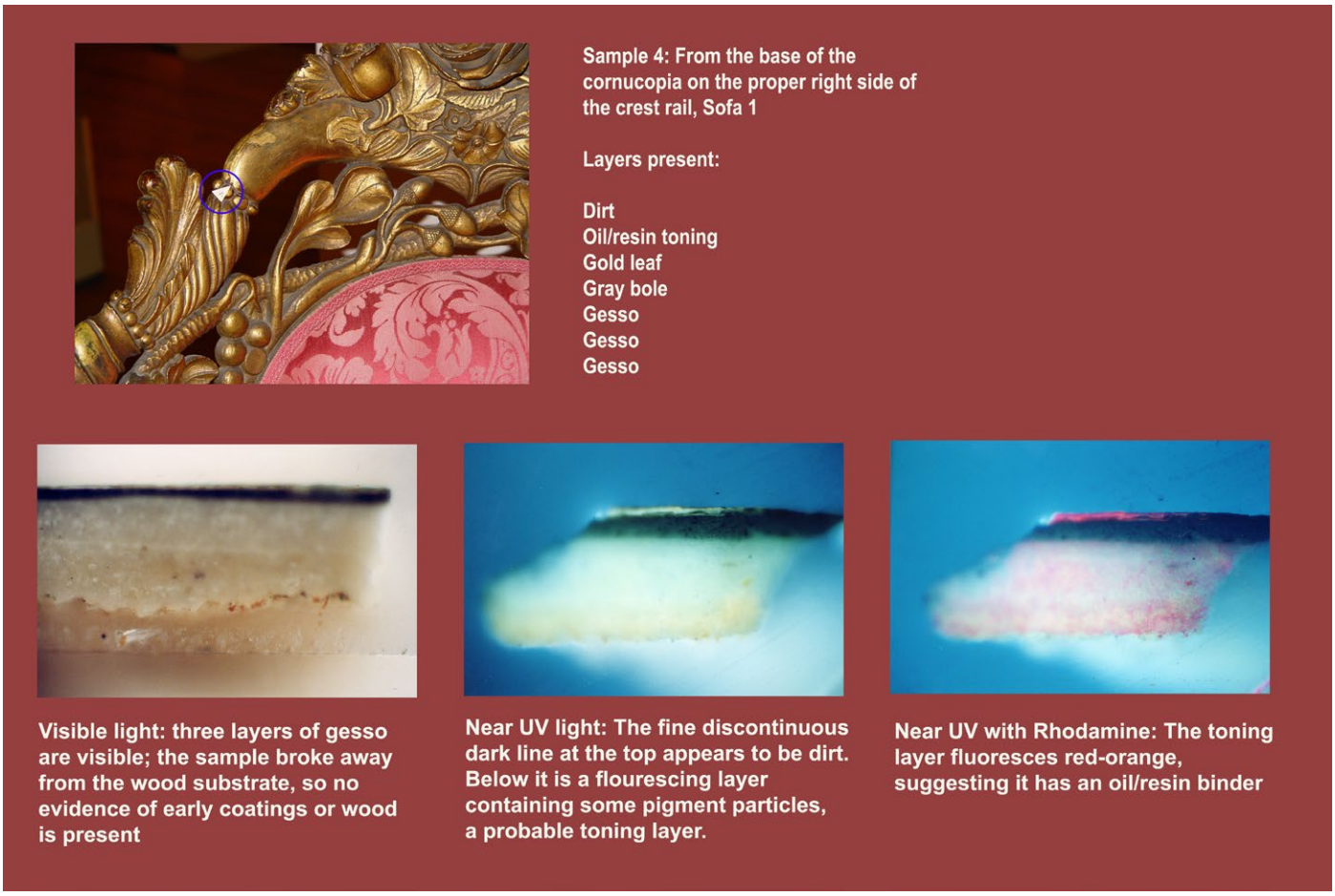


Fig. 7. Microscopy from a water gilded surface.

the complicated history and several "regilding" campaigns, several methods were employed to remove the oil gilding. A 50:50 solution of alcohol:acetone proved effective in what appeared to be the "original" gilded areas; alcohol worked too rapidly and often removed the gilding rather than just the dirt. A mineral spirit gel was prepared that was very successful in more sensitive areas in leaving the gilding intact. Bronze paint was very tenacious. In some areas, it was removed with a methylene chloride stripper and in others, we chose to regild or inpaint over the bronze paint with various methods as it was intractable.

After cleaning, areas lacking gilding were ingilded and inpainted where appropriate to represent the appearance of a continuous gilded surface. The results were dazzling, especially where the interplay of water juxtaposed with oil gilding actually enlivened the surfaces that, when dirty, appeared dull and lifeless (fig. 8). Losses were compensated but the surfaces were not made to look entirely brand new.

For sofa number two, we at first thought that removing the gilding would actually be easier than trying to clean the gilding. Removing the oil gilding proved not too difficult as the resin varnish finish coat in many areas acted as a barrier between the original surface and the layers applied later. The dimethyl ester-based 3M Safest Stripper product proved very effective in this process (dimethyl adipate and dimethyl glutarate specifically).

Care was taken to remove the gilding without disturbing the resin varnish, which was believed to be original. In the areas of water gilding, however, much of the resin coating had been stripped in order to facilitate coating the wood smoothly with the layers of gesso that preceded the bole and gilding. This gesso was tenaciously ingrained into the wood. Figure 9 shows a detail of a partially cleaned oil layer (the carving) next to the bare wood of water gilding during removal. This image shows the details revealed in the carving with the removal of the gilding and also shows the stripped wood under the adjacent water gilding.

Fig. 8. Crest rail of 54.15.2 before and after treatment. Photo: Katherine Wetzel ©VMFA

Fig. 9. Details of 54.15.1 during treatment. Photo: Jennifer Bridges ©VMFA

The final touch was the addition of Regalrez 1094 (a 20% solution in Shellsol 340HT) in the areas where the varnish had been stripped; wax was applied to areas that had previously been oil gilded to supplement the original resin varnish.

The satisfaction that resulted in what was revealed made it worth every minute of the effort and validated the decision to return these surfaces to the original appearance of carved rosewood (fig. 10).

Another aspect of the overall treatment was the decision to reupholster the "ungilded" one. This process could provide enough information for another paper entirely, so it will not be covered here. The most significant points are that (1) a thoroughly researched and skillfully carried out reupholstery campaign was carried by Jennifer Zemanek and (2) during deupholstery, a fragment of a German newspaper was uncovered, with the date 1848 printed on it. This does not mean that

Fig. 10. 54.15.1 after treatment. Photo: Katherine Wetzel ©VMFA

the sofa was actually made in 1848 (as the newspaper used could have been 1–3 years old), but it does give us a *terminus post quem* for the creation of the sofa. Also, the use of newspaper in between plies of the wood is consistent with the working method employed by the Belter workshop in creating the furniture.

REFERENCE

Mooz, R. P., and C. J. Weekley. 1978. American furniture at the Virginia Museum of Fine Arts. *The Magazine Antiques* 113(5): 1061.

SOURCES OF MATERIALS

3M Safest Stripper
65–75 wt% water;
20–30 wt% Dimethyl adipate;
1–5% Dimethyl glutarate;
1–5 wt% Smectite.
St. Paul, MN 55144

Regalrez 1094
Hydrogenated hydrocarbon resin
TALAS 20 West 20th St.
New York, NY 10011

AUTHOR BIOGRAPHY

KATHY Z. GILLIS joined the Asian Art Museum of San Francisco as Head of Conservation in November, 2014. This paper was the result of research carried out at her previous position at the Virginia Museum of Fine Arts, where she worked for 17 years. Kathy received an MS in Conservation from the University of Delaware/Winterthur Museum in 1993 and has been actively engaged with many WAG activities since 1998.

ALEXANDER M. CARLISLE AND MICHAEL BELMAN

Accentuating the Positive: Treatment of the PicNic Suite of "Fancy" Furniture

ABSTRACT—Picnic, a classically inspired mansion, was built in Pittsburgh in the 1830s by the attorney William Croghan. Before the house was demolished in 1955, the furnishings were dispersed by auction. Over time, the Carnegie Museum of Art was able to assemble 10 side chairs and 2 recamiers from the grand Greco-Roman parlor. However, the differing histories of use, restoration, loss, and neglect left most of the suite unexhibitable. In 2007, the decision was made to restore the entire suite. This paper discusses the conservation treatment and reviews the critical reasoning behind the process.

1. INTRODUCTION AND HISTORICAL FRAMEWORK

The suite of rosewood-grained and gilded furniture described in this treatment was named after PicNic, the home of the successful attorney, William Croghan, in Pittsburgh, Pennsylvania (fig. 1). The house was begun sometime after 1832 and then enlarged and embellished for his only daughter, Mary, in 1835 when she was just nine.

At the age of 15 while in boarding school in Staten Island, New York, Mary met, fell in love, and promptly eloped to England with 43-year-old Captain Edward Wyndham Harrington Schenley of the British Army. It was the captain's third elopement. To make a rather long and complicated story short, Mary eventually did return to Pittsbugh at her father's urging and another round of enlarging and embellishing the house ensued, but she did not stay long before returning to England. It should be noted that Captain Schenley and Mary apparently enjoyed a long and prosperous life together, had seven children, and in spite of their scandalous beginnings were eventually granted audience with Queen Victoria.

William Croghan died in 1850 and Mary inherited his extensive properties in Pittsburgh. Among these were the 19 acres that she donated, and on which Andrew Carnegie built the Carnegie Institute, including the Carnegie Museum of Art. It was for this connection that the PicNic suite was selected to be a key exhibit for the reopening of the newly renovated Bruce Galleries of the Museum.

The PicNic suite is associated with the Greek revival ballroom. The grand ballroom was embellished in 1835 by carver Mordecai Van Horn, with hand-carved Corinthian columns, an ornate plaster frieze, and lush plaster ceiling moldings and rosettes. Although PicNic House was torn down in 1955, the original ballroom from the house has been reinstalled as part of the period rooms (fig. 2) in the Cathedral of Learning in Pittsburgh. The reconstructed ballroom is visible to this day by special appointment.

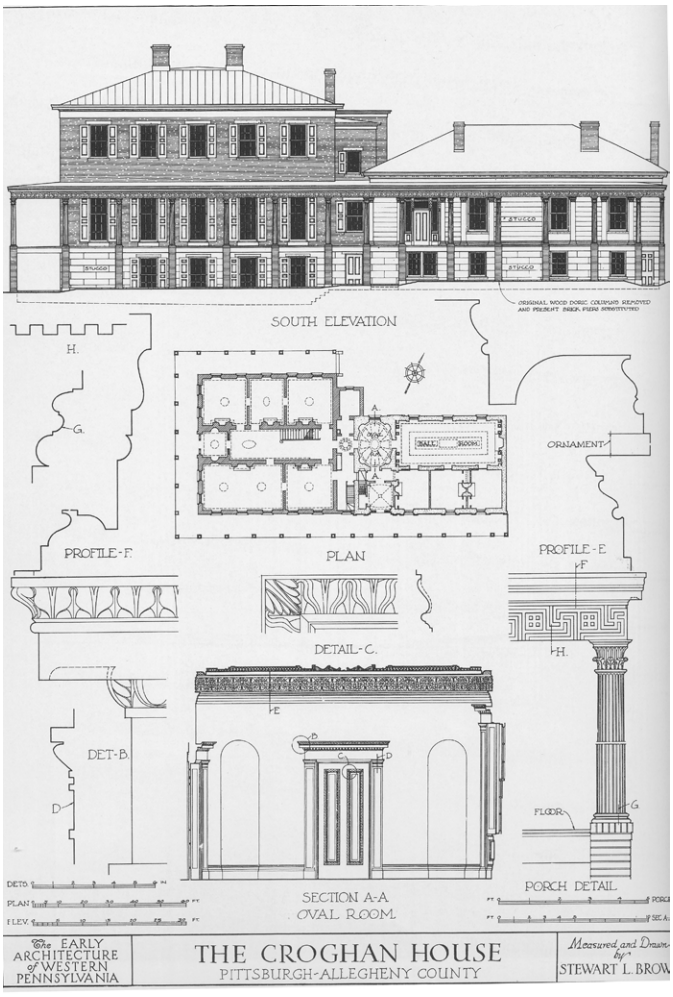


Fig. 1. Drawing of PicNic House from the Western Pennsylvania Architectural Survey, illustrated by Stewart L. Brown.

Fig. 2. PicNic Ballroom reinstalled in the Cathedral of Learning, Pittsburg.

In 1931, 24 years before the house was torn down, the PicNic suite was dispersed at a public sale of the contents of the house, with some pieces purchased by the Carnegie Museum. Additional chairs were purchased as they could be tracked down or were offered to the museum in 1975 and 1983. The current suite consists of 10 chairs and 2 recamiers. Due to a mixed history of use, neglect, damage and previous restoration, it has largely remained in storage (fig. 3). Two chairs and a recamier were treated in 1976 for exhibition; the recamier was retreated in 1999.

The suite is decoratively painted "Fancy" furniture in the Greco-Roman style with faux rosewood graining and elaborate ornamentation. A wide variety of hand-painted or stenciled gold-leaf elements combine to create the full impact of the decoration, including gold stringing in several tones, bellflowers, acanthus leaves, garlands, leafy branches, and solid sections of yellow-ocher toned gold paint. The ornamentaion incorporates polished brass mounts in the form of wreathes, sphinx (adding an element of Egyptian Revival), balls, buttons, rosettes, and interlacing plaques. The seats are of fine woven rush and appear to have been originally painted yellow ochre. The two recamiers share nearly all these decorative elements but also have gold-painted peacock fans as well as Apollo mask and hippocamp mounts.

Fig. 3. PicNic chair examined in storage, before treatment. Courtesy of A.M. Carlisle Art Conservation.

The origins of the suite remain elusive. It would be wonderful to find a direct connection to Pittsburgh, though it seems more likely that the suite was imported from a larger furniture-making center on the East Coast. Two other sets of closely related recamiers have been identified. These include a remarkably similar pair of couches with a history in the Moses Myers family of Norfolk, Virginia (now at the Chrysler Museum of Art), and single recamier, plate #536 from Helen Comstock's book *American Furniture*, possibly still located at the Brooklyn Museum. Two other related pieces were pictured in a May 1993 article from *Antiques Magazine* as attributed to Hugh Finlay in Baltimore, Maryland. One is a Grecian couch, ca. 1820, in the collection of the Museum of Fine Arts Boston, and the second is a sofa, ca.1825, in the collection of Stiles Tuttle Colwill.

Stylistically the PicNic suite is dated sometime between 1815 and 1825, at least 10 years earlier than the enlarging and embellishment of the PicNic house.

2. TREATMENT CONSIDERATIONS

Although the conservation and stabilization of the PicNic suite entailed a number of treatment steps that are commonly practiced and well understood, the restoration of the decoratively painted surfaces proved somewhat more complex. This was not only because of the extensive losses to the surface layers but especially because of the number of decorative layers lost. In the areas of greatest detail, the restoration process required nine distinct coating layers. Each of these layers had to be compatible with the adjacent layers, distinct, stable, and completely reversible. Of course, most importantly, the surface quality had to be convincing in color, texture and sheen, and lacking any impression of synthetic materials.

To accomplish these goals, a great number of materials, including barrier coatings, fillers, inpainting media, gilding, and gilding mordants, were selected for specific properties and tested in layers on wooden panels. The testing process was fairly straightforward. Various fillers, barrier coatings, and resins were applied to wood and prepared wood surfaces (fig. 4). The sequence of application was varied, as well as drying times between each layer. The built-up surfaces were judged, visually, for an acceptable appearance when placed next to original surfaces, and for adhesion between layers by applying masking tape and ripping it off the surfaces. Failure of one test usually led to

Fig. 4. Example of coating test series. Courtesy of A.M. Carlisle Art Conservation.

another round with the addition of some additive to reduce gloss, or improve "tooth" or adhesion between layers. Several test materials and coatings failed for a lack of adhesion to one another. In many cases, the filler could be easily chipped away from the barrier layer, or the inpainting media would not wet onto or evenly coat the filler or barrier layer. An initial plan to avoid solvents altogether and to use water-based materials such as Aquazol failed for excessive sensitivity to water. The typical acrylics and other synthetic resins appeared too "plastic," and provided an unacceptable imitation of the original surfaces. The list of failed resins, fillers, and coatings was quite large, even under such minimal testing conditions.

3. ANALYSIS

Cross-section and instrumental analysis of the decorative coating was an integral part of the conservation treatment and the restoration of the decorative paint layers. Before treatment began, a series of microscopic cross-section samples were removed from the decorative surfaces of the chairs and recamiers and taken to Orion Analytical LLC for identification and analysis. (Cross-section samples are generally about the size of a printed period on this page, though larger samples can be as large as a printed "o" on this page.)

The samples were examined for answers to a series of very specific questions:

1. Were the layers and application of paint consistent between the objects making up the suite? In other words, was the suite all of one and fabricated at the same time?
2. Could the dominant pigments and binders be identified in the coating layers?
3. Were there unusual or noteworthy coating sequences that would be useful in recreating the original decorative surfaces?
4. Are the gilded passages gold leaf, gold powder, or bronze powder?
5. Were there indications, traces, or more, of the original coating varnish on the decorative mounts?

Of course all of these questions were asked knowing full well the limitations of time and budget; nonetheless, it was hoped that there would be answers to the most basic questions and that some valuable information would be gleaned. However, it is important to note that within the limited sample number some of these results must be considered *indicative* and not *conclusive*.

Of the original 16 samples, numbers 4, 7, and 11 proved worthless due to sample fragmentation. That is to say, the sample broke up into fragments and those fragments could not be oriented to provide an accurate sequence of material. The remaining samples were examined and photographed under visible and ultraviolet light.

A comparison between the samples provided the answer to the original question, the paint quality and system of application appears consistent enough that the suite is understood to be all of one and fabricated at the same time and place.

The layering sequence provided valuable information for later reconstruction. Some of the information, such as the identification of a gray priming layer, was unsurprising, but under 200x magnification, the "black" paint layer in the rosewood sequence was identified as a very, very, dark red based on the clearly visible pigment particles. FTIR analysis identified these as iron particles as in red ocher, and lead as in red lead. There were small traces of mercury in this layer, and more in the red pigment/glaze layer above it indicating the vermillion pigment that had been suspected all along.

The most surprising discovery in the cross sections came much farther along in the treatment of the suite. During the reconstruction of the bronze paint layer visible on the legs, rear leg posts, and in the background to the seat rail, medial rain and crest rail mounts, the test paints appeared dull and lifeless, like paint, not like bronze. In reexamining the original cross sections to see what was missing, it became clear that the "bronze" paint was made up of three or four separate layers. Sample number 8 from behind the sphinx on one chair consisted of a yellow paint layer above the "rosewood" paint layer then a clear coating, then a dull orange paint layer, then the bronze paint, and then a coating layer. In following these layer structures, the resulting restoration gained a depth, surface variation, and convincing appearance that was lacking in the simple one-layer attempts.

For the most part, the decorative metal passages were easily identified in the cross sections as bronze powder flakes, or continuous gold leaf. What was missing was a complete cross section of the decorative leaves on the crest rail. Visually these leaves appeared to be fabricated by using period stencil gilding with the addition of passages of gold paint, toning, and decorative pigment paints. The one cross section of a crest rail number 12 was partly fragmented and incomplete.

Determining the original treatment intent for the decorative mounts was also problematic, and analysis was once again an invaluable tool in identifying, in this case, the complete lack of evidence. Once removed from the furniture and placed where they could be viewed as a group, the tremendous range of color and condition, from bright gold to nearly black, became instantly apparent. Somewhere among that group, this team hoped to identify any remaining evidence of the original coating or original treatment. To that end, the mounts were scrutinized under 7–40x magnification with visible and UV light for areas of intact or deteriorating coating material. Small samples were removed from those few areas that appeared to show some evidence and these were analyzed using FTIR spectroscopy at Orion Analytical. No evidence of an original coating was identified. The most "golden" mounts of the group were identified as oil gilded, and these samples came from the two chairs restored in 1976.

Following ultrasonic surface cleaning of the mounts, they were again examined for evidence of previous coatings and a few more promising areas were identified. Once again these sites were sampled and analysis was run with FTIR and RAMAN spectroscopy. Once again, no coating material—either original or later—was identified. Although the lack of original coating material was disappointing, identifying that no original coating material remained did allow for the even surface polishing that ultimately brought the appearance of the mounts back to a unified whole.

4. TREATMENT

4.1 STRUCTURAL STABILIZATION

The chairs and recamiers were carefully inspected for loose or failed joinery. On the chairs, problems were most apparent at either end of the seat side rails with the top of the front leg often split and the rear seat rail to rear leg post joint loose from glue failure. The second most frequent joinery failure was at the four tenon ends of the scroll sawn medial back rail (fig. 3). This was often associated with existing breaks, previous repairs, and missing rail ends with the majority of loss and damage occurring at the terminal volutes.

The seat rail to leg and rear post joinery was reglued using liquid hide glue ("Old Brown Glue," a small batch hide glue, developed by Patrick Edwards, to which a minimum amount of traditional urea has been added to retard gelling) injected with small 22-gauge hypodermic needles into cracks, splits, and open joinery. In all but a few exceptional cases the original hide glue was intact, and the liquid hide glue was useful in refreshing the original glue to create a new bond. The joints were clamped in place to ensure proper alignment and close contact until set.

Repairs to the medial back rail volutes and tenons were made after first clearing older hide glue residue from breaks, tenons, and mortises using Laponite RD, a water-based synthetic clay gel, to soften the aged glues. The softened glues were removed with clean cotton swabs, and the surfaces were rinsed with clean tap water applied with clean cotton swabs.

Poorly aligned older repairs were separated, cleared of older glue residue, and reglued with liquid hide glue. The repaired joints were gently clamped to ensure close contact and accurate

Fig. 5. Failing rush below chair seat. Courtesy of Arthur Evans ©

alignment until the glue had fully set. Decoratively painted surfaces adjacent to the repairs were temporarily protected from glue and water with Butchers Bowling Alley paste wax. The wax was cleared with either VM&P Naphtha or mineral spirits once the glue had set.

4.2 Structural repairs and replacement of losses

Missing wood structural elements were replaced with carefully fabricated copies of the original material. Aside from minor losses from wear or impact to the edges of show surfaces, most structural losses occurred on the medial back rail. These losses included large sections of two medial back rails, eight back rail volutes, and a number of missing gilded wooden balls.

The missing medial back rail sections were replaced with beech wood (*Fagus grandifolia*), easily identified as different from the cherry (*Prunus serotina*) that the suite was originally fabricated from. The missing volutes and tenons were also fabricated from beech. The replacement pieces were sawn, shaped, and assembled to blend with the originals. Small replacements to the back rails were glued in place with Araldite 1253 structural epoxy over a barrier layer of hide glue. The tenons were glued back in place with liquid hide glue.

Losses to the show surface edges, significant dents, abrasions, and damage to wood surfaces were replaced with Araldite 1253 structural epoxy over a barrier layer of hide or fish glue.

4.3 Rush seat repairs

The rush seats of the suite appear to be entirely original and in a remarkable state of preservation, although the early or original yellow paint on the show surfaces of the rush remains only as dark fragments. However, the rush has become increasingly brittle over time and small sections have been lost on both the show side and the underside. In addition, the loosely woven bottoms of a number of chairs and the recamiers have begun to fragment and sag (fig. 5).

To stabilize the seats, the failing sections had to be brought back to their original locations and secured. This was accomplished by using several different techniques to provide even support to the fallen rush while trying to avoid placing additional burden on the already weak and brittle rush.

Small, lightweight sections of broken rush were held back in place with sheer polyester fabric "band-aids" wrapped around the broken rush and then around secure rush on either side of the break. The ends of the band-aid were secured to itself with either Acryloid B-72 or stitched with polyester thread.

More substantial breaks, such has those on one recamier, were supported by using Japanese tissue on both the top and bottom of the break to indirectly stitch the sagging section back into place with clear fluorocarbon thread (Berkely *Vanish* 100% fluorocarbon fishing line 4 lb, 0.007 in. diameter).

The most damaged seat required the use of a medium-weight Fiberglas window screening (washed) below the seat to organize the failing center weave of the rush while providing support. The screening was held in place by fine stitches of fluorocarbon thread extending through the seat and around the twisted rush of the show surfaces. The tension of the stitches was kept to a minimum by treating the chair upside down and allowing the weight of the rush seat to fall back close to its original orientation.

Losses to the show surfaces of the seats were replaced with modern paper rush. Although paper rush is available in a number of thicknesses or diameters, even the smallest was too large to match the fine rush of the PicNic suite. To compensate, the paper rush was unraveled and a portion cut out. It was then moistened with water and twisted back together to match the slightly irregular diameter and smaller size. Modern rush also comes in a single twist while traditional rush seats are woven with opposing twists on each half of a section. To maintain the proper twist orientation, a second group of paper rush was unraveled, trimmed, wetted, and retwisted in the opposite direction.

The replacement rush was generally secured in place by slipping a toned (with thinned Golden Acrylics paint) section of Japanese paper beneath the loss and extending it beneath the adjacent secure original rush. The Japanese tissue was laminated of three layers, by wetting and clamping, to provide a more "stiff" underlayment (fig. 6). The replacement section of rush

Fig. 6. Toned Japanese tissue inserted under rush. Courtesy of A.M. Carlisle Art Conservation

Fig. 7. New paper rush fills secured to Japanese tissue. Courtesy of A.M. Carlisle Art Conservation

was selected to match the size and twist of the loss and secured in place to the underlayment with Acryloid B-72 in acetone (1:1) (fig. 7). The ends were often, but not always, wrapped with a layer of thin Japanese tissue to disguise the joint. The tissue was wetted to shrink in place and conform to the rush when drying. In sections that required a row of loss replacement, the tissue wrap often became more visible than the joints were without tissue and they were omitted.

4.4 RUSH SEAT SUPPORT

Treatment to stabilize the seat bottoms was followed by the application of a sheer polyester monofilament fabric (PECAP) to the inside of the seat rails on the chairs and the tops of the seat rails on the recamiers to support the rush from below and to protect the brittle rush from potential damage in handling. One chair seat of the group retained a sheer polyester rush support from the 1976 treatment. The fabric was secured with Acryloid B-72 (1:1 w/ acetone) applied by brush to the seat rails and allowed to dry. The edges of the B-72 were delineated by low-tack tape to maintain an even edge during application. The fabric was then heat-set in place using a low temperature setting on a tacking iron and the edges of the fabric were trimmed with a sharp scalpel cutting away from the seat rails. The support fabric retains sufficient transparency to clearly see the rush through it (fig. 8).

4.5 RUSH SEAT SURFACE CLEANING

The rush seats were carefully vacuumed through a nylon screen while gently brushing with a soft-bristle brush to remove loose dirt, dust, and debris.

The show (upper) surfaces of the rush seats were cleaned following stabilization using a barely damp PVA sponge. A number of systems were tested, including dry cleaning with eraser crumbs and soft solid erasers of various types, simple solvents, and aliphatic hydrocarbon and surfactant blends, though only the PVA sponge provided a significant visual improvement (fig. 9).

Fig. 8. PECAP under-seat support. Courtesy of Arthur Evans ©

Fig. 9. Rush chair seat during surface cleaning. Courtesy of A.M. Carlisle Art Conservation

Fig. 10. Detail of dirty leg post with decorative button removed. Courtesy of A.M. Carlisle Art Conservation

4.6 DECORATIVE PAINT SURFACE CLEANING

The show surfaces of the PicNic suite were generally dark and covered by an oily grime, apparently the product of long-term exposure to an industrial environment (fig. 10). To remove surface dirt and grime, a series of cleaning systems were spot tested on the surfaces, moving from the weakest to stronger. The surfaces were first tested with simple solutions of water, chelators in water, and surfactants and water, each producing generous results of blackened cotton swabs and visible surface improvement. Of the initial test group, the chelator appeared most successful in lifting the black grime, and the process of fine tuning the solution resulted in a solution of 2% ammonium citrate in distilled water adjusted to a pH of 8.5 with the addition of 2% benzyl alcohol to break up the oily components of the grime layer resulting from coal and oil combustion.

This solution was used to surface-clean two chairs with minor ongoing adjustments to the formula to increase its effectiveness.

Although the initial cleaning solution produced very good results, the thickness of the grime layer required repeated wetting of the surface. In an effort to reduce the time the surface was wetted, the cleaning solution was eventually adjusted to a slightly higher pH with the addition of a surfactant. The final formula of 500 mL distilled water, 10 g ammonium citrate dibasic, 2 mL benzyl alcohol, and 1 mL Triton XL-80N, pH adjusted to 9 with ammonium hydroxide, was significantly more effective. During cleaning, especially grimy and difficult passages, in particular areas of bare wood, were assisted with the addition of 10% acetone added to the cleaning solution.

In process, the chairs were cleaned using hand-rolled cotton swabs wetted with the cleaning solution and applied to the chair surfaces in areas of 10–15 in.^{2} (2 × 5 in. or 3 × 5 in.). Each area required 6 to 12 swabs of cleaning solution followed by rinsing with 3–5 swabs of clean distilled water. A final rinse of V M&P Naptha was used to clear any remaining Triton XL-80N from the surfaces.

The extent of time the surfaces were wetted resulted in minor surface blanching of the original varnish and a cloth pad slightly dampened with ethanol was wiped once over the show surfaces of the chairs to eliminate the surface blanching and to resaturate the original varnish layer.

The two chairs cleaned with the first formula were recleaned with the final cleaning solution.

4.7 BARRIER LAYER

Following the aqueous cleaning, the surfaces of the chairs were coated with a reversible barrier layer to protect the original surfaces from the restoration layers (fig. 11). The barrier coating of 25 g Larapol K-80 and 25 g Acryloid B-67 in 425 mL xylene and 50 mL Stoddard solvent was slightly matted with 0.5 g fumed silica. A single coating of the barrier formula was applied by brush over all show surfaces. This formula was recommended by another conservator, and in working properties was superior to all alternatives tested; however, in subsequent treatments, this formula was later changed to B-72/Larapol A-81 1:1 with remarkably similar working properties. The potential for crosslinking in both B-67 and Larapol A-80 is best avoided.

Fig. 11. Chair back following surface cleaning and barrier layer. Courtesy of Arthur Evans ©

4.8 SURFACE FILLS

The losses to the painted surfaces were filled with Beckers Latexspackel[1] applied with a flat soft plastic applicator. The Beckers was selected as a fill material over a number of tested alternatives due to favorable working properties, limited shrinkage, superior adhesion to the barrier layer, and ease of reversibility in water.

Following application the filler material was allowed to fully dry, and was then leveled with a soft flexible plastic pad covered with a slightly dampened clean cotton cheesecloth. Usually more than one application of the Beckers was required to attain a fully filled and level surface.

Once the surface losses had been largely filled and leveled, the residue surrounding the filled areas was cleared with spit dampened clean cotton swabs, revealing the islands of white Beckers fill. These steps were often repeated to obtain an evenly filled and level surface (figs. 12, 13).

Fig. 12. Clearing excess fill material. Courtesy of Arthur Evans ©

4.9 INPAINTING

The losses to the decorative paint layers were restored with finely ground pigments in Galdehyde Resin Solution (LarapolA-81[2]), produced by Robert Gamblin paints. A number of premixed Galdehyde colors were used including black spinel, cadmium orange, cadmium yellow light, cadmium red medium, raw umber and Indian red. Finely ground pigments were also used to inpaint and adjust colors, and glass microballons were added to create texture where needed. Following various experiments, a solution of refined turpentine and 10% acetone was used as an inpainting solvent. The turpentine/acetone mixture had excellent working properties and kept the sable brushes supple. Of the solvent solutions tested it was selected for having the slowest interaction and reduced solubility with the barrier coating. In spite of this, a one-stroke policy (to reduce reworking a wetted area) was used to reduce any interaction with, or solubility of, the barrier layer.

The first step in inpainting was to tone the countless islands of white Beckers Spackel fills with a ground layer of black spinel, cadmium orange and Indian red pigmented Galdehyde resin (fig. 14). Analysis had shown that the ground layer was not black, but a very dark red. This process was followed by recreating the areas of loss to the rosewood grain–painted layer (fig. 15), and was divided into three levels of restoration.

For show surfaces with clear losses down to the bare wood, the surfaces were inpainted to meet the intact areas on either side of the missing area.

For areas of significant wear to the paint surfaces, particularly to the upper surfaces of the side rails, the existing rosewood paint was "enhanced" to bring the surfaces to a reasonable even appearance of "expected wear."

The third restoration level was used for the huge areas of loss that were common to the backs of the rear posts and crest rail. In these later cases the areas of remaining paint were so minor in relation to the areas of loss that the decision was made to overpaint the

Fig. 13. Chair during treatment before inpainting. Courtesy of Arthur Evans ©

Fig. 14. Inpainting the dark red base color over the fill material. Courtesy of Arthur Evans ©

Fig. 15. Inpainting the rosewood grain painting. Courtesy of Arthur Evans ©

remaining "islands" of original material. These tiny "islands" are now encapsulated in completely reversible materials.

4.10 BRONZE PAINT

Significant losses to the bronze powder–painted areas included the elongated ovoid sections on the front faces of the rear leg posts, as well as the backgrounds to the brass mounts on the front seat rail, the medial rail, and the crest rail. In addition to significant loss to these areas, the bronze paint had oxidized over time resulting in a significant color shift and rendering these areas dull and lifeless. Following much discussion and consultation with the curator, it was decided that the bronze-painted surfaces should be overpainted to restore the original color harmonies to the decorative surfaces. To that end, cross-section analysis of original paint samples from the chairs proved invaluable. The cross sections confirmed the paint layer is composed of finely ground platelike metallic particles as would be expected for bronze powder paint. In addition the cross sections revealed a three-layer sequence for building up the bronze surfaces. This consisted of a dull orange ground layer below the bronze paint, and with a toning layer above to patinate the show surface.

The difficulty of recreating the original color and appearance of the bronze-painted surfaces was compounded by a significant color variation in the original bronze surfaces. These variations appear to be caused by an inconsistent surface oxidation apparently due to irregular thickness of the toning layers and the protective clear overvarnish. The thickness of the outer coating layers can significantly reduce the rate of oxidation of bronze painted layers. Selecting a model color, among such a wide color range, was significantly aided by the evidence of three coating layers visible in the cross-section analysis. It was clear that the goal was a warm, and slightly orange, tone based on the identified ground layer.

A survey among the existing bronze-painted surfaces of the PicNic suite revealed a single remaining surface on the footboard of one recamier that appeared both minimally oxidized and retained a warm, slightly orange, tone. This background surface was selected as a color model for the entire suite. In practice, the recreated bronze paint was made slightly brighter than the model to reflect some amount of oxidation in the original surfaces. This original surface was not overpainted or toned and remains visible for comparison to the recreated surfaces on the suite today.

For efficiency in recreating the bronze paint, a single color was mixed to match the color of the original surface using nonoxidizing mica powder pigments in imitation of the bronze paint; however, a number of test samples of the recreated paint appeared relatively dull and lacked the hard metallic quality of the original surface. As a comparison, the original layer system of dull orange ground, bronze paint (now mica pigments), and toning layer was recreated, resulting in a much closer match in color and surface quality to the original. This system was used to recreate the bronze surfaces on the entire suite. In practice, the layer structure was built up of a dull orange ground layer of Galdehyde resin and finely ground pigments. A thin layer of gum arabic was applied over this layer to prevent the thin layer of mica powders and Galdehyde resin from mixing with the ground layer as the surface was thinly brushed. Finally, the toning layer of Galdehyde resin and finely ground pigments was applied.

4.11 GILDED SURFACES

The larger losses to the gilded surfaces were restored with gold leaf and minor losses were inpainted with either shell gold (finely ground gold in gum arabic) or fine mica powders in Galdehyde resin. The gold leaf was secured to the rosewood grain–painted Galdehyde resin layer with a traditional oil varnish (Charbonnel, three-hour gold size). The varnish layer was colored in imitation of the original yellow-toned sizing layer with finely ground pigments. Two distinct gold leaf colors were used on the original

surfaces and these were carefully matched with a 22-karat yellow gold and an 18-karat green gold.

As much as possible, losses to the gilded striping were recreated by laying down the gold size with a free hand to imitate the original lines. Once the size had reached to correct tack, the gold leaf was applied and gently tapped in place with a soft brush. In some cases the striping line was carefully masked with low tack tape, leaving a straight line with an undesired mechanical precision that needed to be adjusted later by breaking the straight edge with fine abrasives or solvents.

The more complex surfaces of the bellflowers, seen in eight places on each chair, were roughly recreated with thin plastic templates to provide an overall size and shape that was then adjusted freehand to individualize them. These stylized flowers varied widely in size, quality, and character throughout the suite and a simple template would not provide enough variation to blend well.

Losses to the particularly beautiful leaves of the crest rail were restored with gold leaf, shell gold and mica powders to imitate the variety and shading of the surfaces. The leafage appears to have been produced with a stenciled pattern of pounced gold powder over a mordant; however, the single cross-section sample of the leaf was incomplete, and this could not be confirmed.

The decorative painted details on the bellflowers and the crest rail leafage were recreated with finely ground pigments in Galdehyde resin or shellac.

4.12 protective coating

Following the restoration of the decorative paint and gilding, the surfaces were "adjusted" to imitate wear and use through light surface abrasion with a 000 ScotchBrite pad, mild solvents, and hand rubbing. A toning solution of finely ground mars black and raw umber pigments in gum arabic was used to deposit a thin layer of "dirt and grime" in those areas that would typically accumulate a dirt layer. This was followed by a final coating of the barrier layer solution of Larapol K-80 and Acryloid B-67 applied by airbrush. The coating was made slightly matte with the addition of fumed silica. The final coating is intended to provide an even overall sheen to the surfaces as well as a protective surface, just as the original clear varnish coating.

Following the final coating, the surfaces were again examined and "adjusted" with hand rubbing, very light abrasion, and the application of hard beeswax applied with a synthetic Norton #0000' abrasive pad without solvents to impart subtle gloss to specific surfaces such as the crest rail and the upper surfaces of the seat rails.

4.13 decorative mounts

Immediately following the "before-treatment" (BT) documentation photography, the individual decorative hardware mounts were carefully removed from all of the chairs and secured in small cardboard boxes. The mounts were secured through a piece of foam core in each box in proper order and orientation to ensure that they would be returned to their original locations. The boxes were labeled with accession numbers. Each button and mount was examined to identify any reproductions. Notations were made to identify instances in which individual mounts had been incorrectly replaced based on identifying evidence such as double nail holes or poor fit.

There were numerous losses to the original decorative hardware on the suite and some of the existing hardware pieces were already cast replacements (ca. 1976?) of reduced quality. Judging by the somewhat different treatment of the cast wreaths, it appears that there may have been two campaigns of reproduction. These differences are clearly illustrated in the accompanying photo documentation (table 1).

Table 1. Decorative Mounts

Description	Original	Reproduction	Missing
Left-facing sphinx	2	1	2
Right-facing sphinx	3	1	1
Laurel wreath	1	2	8
Front rail tablet	10	0	0
Rear leg post buttons	11	0	9
Medial rail buttons	19	6	21
Gryphon/chimera	2 left facing	2 right facing	0
Apollo/Hercules head with fewer radiating points	3	1	0
Apollo/Hercules head with more radiating points	2	0	0
Chrysanthemum button	2	2	0

Replacements for the missing hardware were commissioned from a hardware reproduction specialist, Joan Parcher of Providence, Rhode Island. Carefully selected samples of the missing mounts were sent as master patterns, including doubles of the small medial rail buttons to ensure some variety. Silicon rubber molds of the originals were made and the molds were then sent to a casting specialist to cast the reproductions. This process was especially delicate for the original and only remaining wreath. The wreath was fabricated of very thin pressed brass and the existing reproductions were coarsely cast with lessened detail and heavy weight. It was requested that the new reproductions would be cast with a thin shell and no loss of surface detail and from the outside face were almost indistinguishable from the original. The quality of all the reproduction castings was exceptional, and excluding the wreaths, all were provided with integral cast nails as found in the originals.

To ensure that these reproductions were not mistaken for originals in the future, the mounts and buttons have all been individually marked, on the back side, with black Pigma Micron archival ink pens under a coating of Regalrez 1094 (synthetic low-molecular-weight resin soluble in aliphatic hydrocarbons) to identify them as originals or reproductions. Original mounts and buttons were also marked with the accession number of the chair or recamier to which they belonged.

The surfaces of the original mounts showed remarkable variation in oxidation, polish accretion, dirt, and grime, etc. The range extended from a nearly black oxidized gryphon on one recamier to the gilded surfaces of the mounts from the two chairs restored in 1976. Significant amounts of polish residue had accumulated behind many of the mounts, but there was little evidence to explain the nearly black surfaces.

In an effort to identify evidence of original surface treatment, the mounts were examined and analyzed on two separate occasions by Orion Analytical of Williamstown, Massachusetts. Selected mounts, including the nearly black mount and the gilded mount, were examined under high magnification and minute samples taken from corners and crevices of the surface were then removed for analysis by FTIR and RAMAN.

On both occasions nothing, aside from corrosion products and gold leaf, was revealed. The gilded mounts were simply that. They had been coated with traditional oil size and gilded with gold leaf. No other mounts revealed a trace of the gilding or the oil size. Of the many other samples examined and analyzed, none revealed any trace of coating material or colorant.

Faced with such a wide range of color, dirt, grime, gilding, and the unidentified treatment of the reproduction mounts and buttons, they were all put through the same steps to clean and polish the surfaces in the hope that the color of the underlying metal surfaces was similar.

Step 1: All hardware was placed in an acetone/ethanol bath (1:1) for 15 min. and wiped clean with clean cotton rags to remove grime and the remaining gold and gilding mordant.

Step 2: The mounts were placed in a warm ultrasonic bath with Alconox anionic detergent at 1% for 40 min. The most severely oxidized or encrusted mounts were run for two cycles. The ultrasonic cleaning was followed by rinsing in clean running water, a dip in a formic acid/water solution at a pH of 3.5, immediately followed by a second rinse in clean running water.

Step 3: The mounts were polished with Neverdull, a loose cotton wadding mixed with very fine abrasives and an aliphatic hydrocarbon mixture as a lubricant. Oxidized surfaces on unpolished or coarsely cast surfaces were removed with Autosol cream metal polish applied with a soft bristle brush. In both cases, the surfaces were immediately rinsed in mineral spirits followed by a rinse in acetone.

The cleaned mounts revealed surface subtleties that had not been apparent before. The leading edges of the gryphon wings and tail had been highly burnished in contrast to the relatively coarse surface casting. The sphinxes had also been burnished to highlight the leading edges of the wings, the tail and the plinth on which they rested. To match the originals, these missing qualities were burnished into the old and new reproductions using a rounded and highly polished steel burnisher.

Without evidence of an original coating or finish treatment on the mounts, the final surface treatment would have to rely on early 19th-century descriptions for guidelines. Those descriptions, formulas, and writings suggest that brass furniture hardware was often coated or otherwise treated to make it look more "goldlike," as well as to prevent tarnishing. An additional consideration was that the color of the toned brasses would have to be in harmony with the other decorative surfaces of the chairs and recamiers.

To replicate the color and appearance of what might have been used in period, the typical resins and colorants mentioned in various period formulas were assembled. These included seed lac, gum gamboge, dragon's blood, and turmeric. Following the basic period recipes a variety of coatings were made up ranging from more yellow (gum gamboge and turmeric) to reddish (dragon's blood). These mixtures were used to coat sample buttons and brasses, which were then held up to the recently completed surface of the recreated bronze powder paint. Suddenly what had separately appeared to be excellent, but independent, recreations of the bronze paint and period brass coating were most apparently not in harmony. The formulas for both were again reworked moving the brass coating a bit warmer and less highly colored, and the bronze powder paint warmer as well.

Although the period resins were useful for recreating a period coating, these were not as reliable, light stable and reversible as modern synthetic coatings and the selected color was recreated with Agateen #27 lacquer and Orasol dyes. A small amount of gold mica powders were added to the mixture to lend a higher degree of reflectivity that was thought to be missing from the

original formula (tinted Agateen #27 formula: 0.1 g Orasol yellow GLN, 0.03 g Orasol yellow 3R, 0.07 g Brilliant Gold mica powder, 50 mL Agateen lacquer thinner, and 12 mL Agateen #27 lacquer).

A single coating of the tinted Agateen mixture was brushed on the surfaces of the mounts after a last degreasing of the metal surfaces in acetone. The tinted coating was then sealed with three coats of the clear Agateen #27 lacquer applied by airbrush to the front and backs of the mounts and allowed to dry.

The mounts were finally installed on the suite after the final sealing coating was applied to the decoratively painted surfaces. For the most part the reinstallation involved accurate placement and orientation of the original mounts in their original holes followed by setting in place with hand clamps. In some cases a few quick raps with a rubber mallet were needed to set individual mounts. Beeswax was used to partly fill loose mounting holes when needed. The openwork tablet mounts for the front rails were particularly tricky as the tablet had been bent to imitate the curve of the front rail. This had resulted in the points of the integral nails pointing somewhere between the existing holes in the front seat rail. In most cases the mounts could be slightly spread and "popped" into the original holes, but in some cases the required spread, combined with the old and brittle casting of the mount meant that to minimize risk to the mount, the original holes had to be expanded. These enlarged holes were filled as possible with either Beckers fill material, or beeswax and then inpainted to blend with the surrounding surfaces.

In a very few instances, the original hardware holes did not line up with the replacement mounts or the original holes were inadvertently hidden beneath the Beckers fill material. In these cases the original holes were reopened with a slightly undersized drill bit or, in the case of some of the reproduction hardware, new holes had to be drilled to accommodate the integrally cast nails.

Although some of the mounts do not seat flush with the show surfaces of the chairs, the BT photographs of the suite show that this was often the case in their original setting.

The surfaces immediately surrounding the remounted brasses were toned to imitate the collection of moderate grime and dirt over time using a mixture of finely ground pigments in gum arabic.

The mixture was coarsely brushed into the surrounding surfaces and then wiped clean on the surface of mounts and the areas surrounding the mounts (figs. 16, 17).

5. CONCLUSIONS

Treatment of the 10 chairs and 2 recamiers took almost 1 year to complete from delivery to return shipment. All of the treatment work and storage of the suite during the process took place in a secure, alarmed and climate controlled space just under 350 ft^2. A secure, nonclimate controlled workshop next door was used for fabrication of replacement woodwork, jigs, storage carts, and storing crates.

Fig. 16 Inpainting completed on a chair back. Courtesy of Arthur Evans ©

Fig. 17. Chair from fig. 3 chair after treatment. Courtesy of Arthur Evans ©

Two temporary rolling storage racks were fabricated to be able to stack two rows of chairs or two recamiers to make the most of the limited space. Between treatment cycles, the chairs were kept in individual cardboard wardrobe boxes purchased from a moving company. The wardrobe boxes are double thick with built-in handholds and are well sized for most side chairs. A piece of notepaper taped to the outside front of each box kept track of treatment data. In the end, the wardrobe boxes doubled as shipping crates for the completed chairs with a Tyvek cover for each chair and soft Ethafoam padding.

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NOTES

1. Beckers Farg, 117 83 Stockholm, Sweden, Tel: 0200 212122, www.beckers.se
2. Larapol A-81 remains soluble in hydrocarbon solvents that are 25% aromatic, as well as oxygenated solvents such as isopropanol, ethanol, and acetone.

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PETER MULDOON

Functional Conservation of a Late 19th-century Spring Seat "Iron Back Frame Chair": A Substitute Frame for Supporting Upholstery Springs

ABSTRACT—When a primary reason for collecting historic furniture includes maintaining its original function in daily use, conservation requires an ideal balance of minimally invasive repair that can also withstand continued service. One of the most common problems with 19th-century upholstered furniture is a collapsed seat of unsupported springs from decayed twine and broken webbing. Traditional techniques for sprung seat repair are destructive, and conservators have developed alternative methods of support. This paper discusses a non-damaging method to preserve original material while maintaining functionality with the insertion of an independent structural system of spring support.

1. INTRODUCTION

Different goals for collecting objects of historic and aesthetic value require openness to a variety of conservation approaches that respect the object's social and cultural value, as well as the rights of the collector, especially when a primary reason for collecting includes maintaining an object's original function within a larger architectural context, which is the case for several historic federal buildings in the nation's capital with collections and curatorial departments.

2. MAKING TREATMENT DECISIONS

Conservation Treatment Methodology (2007) by Barbara Applebaum is a classic and useful guide for making intelligent treatment decisions that lays out five stages in the "cultural life of an object" which include creation, original use, discard, collection, and institutional acquisition. This describes the ideal scenario for institutional collecting and preserving objects of cultural value (Applebaum 2007). Institutional acquisition confirms that an object's historic and aesthetic worth has transcended, and now exceeds the value of its original function and use. By virtue of longevity and cultural merit the object has earned a gentle retirement in a controlled environment with limited handling and occasional exhibit.

Before the mid-1990s published treatments of upholstered seating furniture largely concern form and appearance, assuming that an object has been retired from general use and actively protected from accelerated decay. Preservation of furniture function was eventually considered in the conservation literature with a few notable examples including "A minimally intrusive support system for chairs with original upholstery in place," 1995, by Nancy T. Carman, and "Functional conservation upholstery treatments for the real world," 2000, by John A. Courtney Jr (Carman 1995, Courtney Jr 2000).

Preservation of internal materials and structure of upholstered furniture, including springing, webbing, and foundation layers was not reflected until more recently. "Bottoms up!: Some solutions for supporting sprung seats in historic upholstered furniture," 2002, by Debra Trupin, describes inventive treatments for conserving the original materials and construction of collapsed spring-seats, developed at the furniture conservation labs of the New York State Office of Parks, Recreation and Historic Preservation at Peebles Island (Trupin 2002). These treatments preserve the existing materials by introducing easily distinguished and unrelated modern materials to fix the original construction in place, and support the springs and restore the correct appearance, which allows the furniture to continue functioning historically and aesthetically. They do not however allow the objects to continue to function as seating furniture.

3. CHALLENGES TO MAINTAINING FUNCTION

Preserving objects to maintain their use in historic buildings, where it is impossible to approximate museum environmental standards or limit handling creates some obvious challenges. In the Smithsonian's case, furniture in the Castle is exposed to the ongoing demands of human contact, and environmental fluctuations of a porous stone building that routinely exceed museum norms. Additional challenges are the continual discoveries of inappropriate repairs and deliberate alterations to form and function, many done in-house to serve contemporary needs. The physical consequences of ongoing use, repurposing and repair accumulate, which compounds problems of interpretation, as well as simple repair and functional stability.

4. SPRING-SEAT UPHOLSTERED CHAIRS

Resilience and support are the primary innovations of spring-seat upholstery. The principles and technologies of resilient spring-seating were borrowed from the carriage trade near the end of the 18th century and increasingly adopted to improve the comfort of contemporary domestic furniture during the

19th century. The hour-glass shape of upholstery springs, which are easier to stabilize than straight cylindrical springs, was developed during the 18th century; however, iron springs did not become common in chair seats until the middle of the 19th century when technical limitations in fabrication were reduced enough to make them economically viable.

The earliest limitations to the use of resilient spring upholstery in the 19th century were a general lack of high-quality metal and a necessary abundance of skilled labor to effectively use it. Spring-seat construction required a new skill, and too few craftsmen were readily available to bring down labor costs until the middle of the century. The quality of material was inconsistent throughout the first half of the century, and scarcity of technical skill correlates with the quality of available material. Poorly manufactured springs snap if brittle or distort and remain compressed if not sufficiently elastic, which naturally inhibited the need for expertise in using them. Rather than innovations in the design and techniques of upholstery structure, most 19th-century patents simply concern the quality and tempering of spring metal (Grier 1987).

5. TRADITIONAL SPRING-SEAT CONSTRUCTION

The general construction of spring-seat upholstery is familiar to upholsterers and furniture restorers, and hardly varies from the 1850s through the 1930s. Spring seats are easily distinguished on sight from traditional "dead-seat" or un-sprung upholstery by their noticeably greater volume. Springs provide support in a mattress-like frame for the addition of cushioning and insulating layers, commonly referred to as the "cake."

Construction of a spring-seat begins with the wooden chair frame placed in an upside-down position to create the spring loaded foundation for building the seat. Springs are laid out within the frame to distribute pressure evenly, and tied with heavy twine, which is tensioned and tacked into the bottom of the rails with iron, wedge-shaped tacks. Then burlap or linen strips are stretched over the springs, and also tacked into rail bottoms to provide a deck for the springs, which are usually sewn or attached to the webbing with iron clips to provide stability.

The chair is then placed upright so the springs can be compressed from above and fixed into position by tying the top rings of each spring together with twine and tacking them into the top of the seat-rails to create a single, evenly tensioned unit.

A sheet of linen or burlap is stretched over the springs and also tacked into the rails, creating a top deck for layering the upholstery materials. The cake is then built up in layers, starting with a layer of coarse plant material or curled horse hair and covered with layers of cotton batting. A sheet of cotton muslin is stretched over the cake to contain the layers and also tacked into the rails. Finally, the seat is finished with a decorative cover fabric that is tacked into the wooden rails as well.

Of course attaching twine, webbing, muslin, and a cover fabric into a chair frame with iron tacks is inherently destructive, so over time structural failure of a spring-seat is simply inevitable and expected. Organic materials deteriorate and the normal stresses of human contact and use eventually force the springs through the bottom of the seat, unsupported.

6. TRADITIONAL REPAIR

Following the original construction, traditional repair of an unsupported spring-seat involves overturning the chair and working from the bottom. Degraded materials are either removed or left in place to provide guidance, and reconstruction imitates the original construction. Springs must be recompressed and retied with fresh twine and again tacked or stapled into the bottoms of the seat-rails, already damaged in the original manufacture. New webbing is stretched over the springs and again stapled or tacked into the bottom of the rails, causing further damage and adding a new generation of tack holes.

Eventually the rails of a reupholstered chair take on the familiar appearance of fractured cork, which clearly indicates greatly diminished structural integrity, and loss of capacity to hold more tacks and support the seat. Damage is compounded with each successive repair, accelerating a cycle of deterioration until it is no longer possible to tack into the original rails.

Obviously traditional repair is not a very good conservation treatment. For 19th-century furniture to remain serviceable it is greatly advantageous to repair a failed seat with a treatment that is structurally sound and does not amplify the preexisting damage. The first consideration is always how to eliminate the ongoing need to drive additional metal fasteners into the wooden chair frame completely. The collapsed seat of the Castle Collection's "iron back frame" chair provided a perfect opportunity to design a minimally invasive repair with enough structural integrity to return it to functional strength.

7. THE CASTLE COLLECTION'S LATE-19TH-CENTURY "IRON BACK FRAME CHAIR"

The collection's iron back frame chair is an example of an overstuffed armchair with a resilient steel frame. Originally marketed about 1860, an open framework for the back and arms, fashioned of resilient steel is attached to the low wooden base of a seat; a horizontal box frame on four legs. The innovation of a steel back frame expands the idea of resilient seating from under the carriage bench to create a seat that cushions and envelopes the sitter in a fully pliable and comfortable chair. This large, velvet upholstered, iron back frame armchair is one of three similar examples in the Castle Collection that are significant for representing the expansion of resilient technology to include the body of the chair itself (fig. 1).[1]

8. CONDITION AND TREATMENT PROPOSED

When the chair was received in the conservation lab, the velvet cover fabric was in excellent condition. Visual inspection of the rails suggested that the cover fabric had been replaced, as

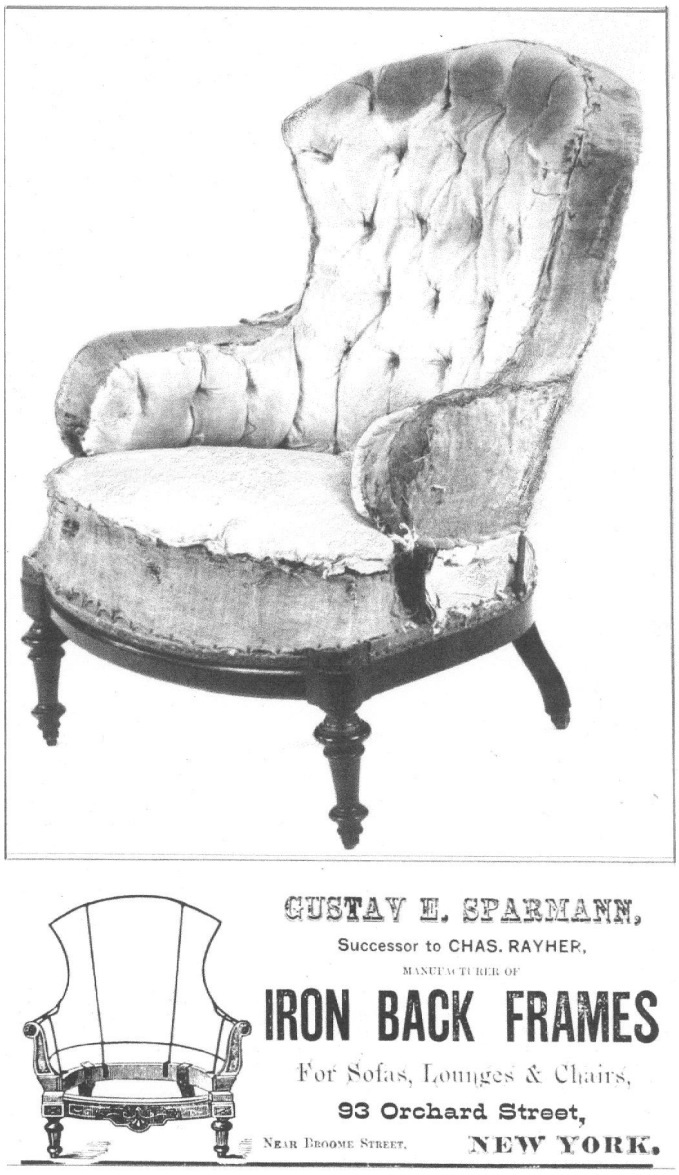

Fig. 1. Iron back frame chair, with advertisement. Turkish armchair, maker unknown, 1888–1892. Gift of Margaret Carson Holt. Accession no. 1970.431. Photograph by David Bohl. Courtesy of Historic New England.

expected, but judging from the extent and pattern of previous tack holes, it appeared that the seat had not been rebuilt more than twice in 150 years of service.

The concept for a nondamaging upholstery treatment involved suspending an internal secondary-frame within the cavity of the existing frame to substitute for the attachment role of the original rails. A secondary-frame of four wooden interior-rails was designed to fit inside the existing frame to isolate the support of the springs from the undercarriage of the chair, and eliminate additional destruction of original material from driving more metal fasteners into the original wooden frame.

The secondary-frame should mate with the original frame by fitting against the inside profiles of its rails, in the space provided by the seat cavity and hang on the original frame from steel brackets shaped like an inverted "L". The L-brackets, also called corner brackets, are small, flat bars of steel, folded 90° that are available at most hardware stores. The vertical flanges should be attached flush with the mating surface of the new secondary-rails, while the horizontal flanges extend 90°, and slip over the top of the existing rails.

The secondary-frame is made to accept all of the new metal fastening hardware. Although the new substitute frame does not relieve the original frame from bearing the weight of the sitter, it does relieve the stress and tension forces of directly supporting the springs. A 0.25-in. mahogany plywood deck should then attach to the bottom of the new frame by bolting into the new rails from below to substitute for the supporting function of the webbing. The internal secondary-frame will then compress the springs between the existing seat cake and plywood deck and be completely removable (figs. 2, 3).

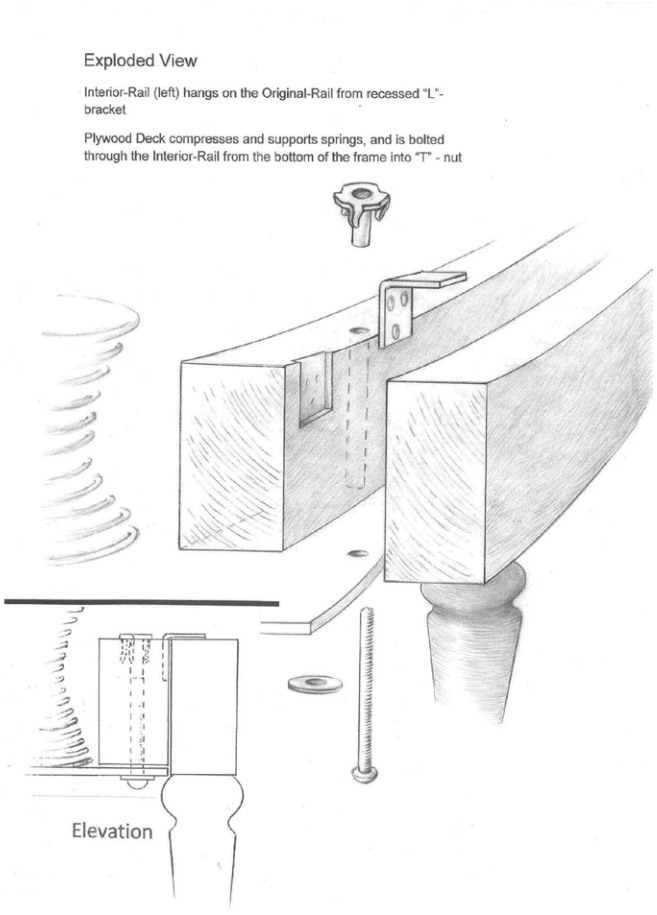

Fig. 2. Exploded and elevation view drawing.

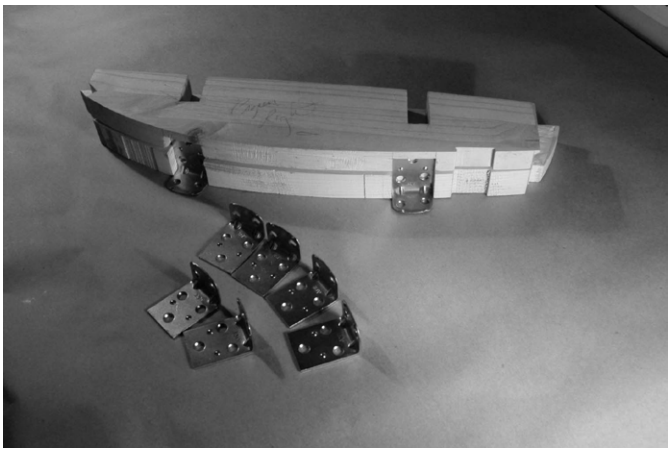

Fig. 3. New rail with hanging brackets.

9. FABRICATION OF AN INDEPENDENT, INTERNAL SECONDARY FRAME

The conservation treatment began like any traditional repair of a collapsed seat with the chair inverted on a bench. Deteriorated webbing was removed and the remains of broken-down burlap vacuumed from the seat cavity. Existing twine was left in place on the springs to provide a guide for retying them with new polyester upholstery twine in the same pattern and spacing, but attaching to the new secondary frame.

To insert a secondary frame into the seat cavity against the inside of the existing frame it is necessary to fabricate and position each new rail one at a time, rather than preassemble and insert a complete frame because inclusion of the steel hanging-brackets prevents insertion as one piece. The inner profiles of the four existing rails were traced onto brown paper, which was then cut into templates for shaping the mating face of the secondary rails to nestle against the inside of the existing frame.

The mating profile of each secondary rail was band-sawn to fit inside its corresponding rail. The inside faces of the secondary rails were then cut back to provide room for the springs to expand laterally when compressed. Shaping the inside of the rails to accommodate the springs also reduces the weight of the secondary frame. Clear pine was selected because it is light weight and very easy to work.

The process of shaping new rails to fit inside the seat cavity while allowing space for the springs, was essentially free-hand and sculptural. After the new rails were cut, semi-circular arcs were sawn out of the inside face for the springs to expand into. These arcs were shaped and softened on the end of a stationary belt sander with the edges tapered to leave sufficient room for the angle of the springs. The depth of the arcs and amount of taper were simply matters of personal judgment.

Each of the four secondary rails was given two L-brackets (2 × 1.5 in. zinc-plated steel corner braces, 14-gauge, from Ace Hardware) to hang off its matching original rail. The entire secondary frame is hung off a total of eight, steel L-brackets. The brackets were then recessed flush into the mating face of the secondary rails, and attached with screws. In order not to tear the existing upholstery materials, the horizontal flanges of the hanging brackets needed to be rounded on a bench grinder, and fitted over the top of the existing rails, and under existing upholstery materials. The hanging flanges were lined with archival Volara®, (a closed cell polyethylene foam) attached with double face tape, to cushion contact with the original rails and provide additional friction to inhibit the new frame from shifting in place.

The secondary rails were fashioned with open mortice and tenon joints, to be inserted sequentially in a counter-clockwise direction around the inside perimeter of the frame. The direction was arbitrary, but an order of insertion was important so the rails could slide together and friction-lock end to end. The rails were assembled by sliding the open morticed joints together horizontally and tapping into place. Open mortice and tenon joints allowed the new rails to be inserted, removed, and reinserted during the fitting phase as often as necessary. They also allow for reversibility of the treatment, which can be easily disassembled at any time in the future.

Attaching the springs and tensioning the twine however draws the rails out of their open joints and into the center of the seat cavity. So the rails also need crossbeam spacers to be stabilized horizontally and keep the secondary frame in place, nestled against the inside of the original frame. Four slender crossbeams were cut from pine and notched to lace together at their intersections, and inserted into notched pockets cut into the rails to receive them. The beams were drilled to screw in place over the springs and stabilize the new frame against the inside of the original, stiffen the structure, and they can be easily disassembled with a screw driver.

To lay out bolt holes for attaching the 0.25-in. flexible plywood deck that substitutes for traditional webbing and spring support, the secondary frame was assembled with the crossbeam spacers temporarily screwed into place. An awl was used to mark the most advantageous attachment locations, and on a drill press after disassembly, the back rail and two side rails were each drilled for three 0.25-in. machine bolts, and the front rail, which is narrower and has a more complex shape, was drilled with two holes, for a total of 11 deck bolts. T-nuts were then inserted into the top-side of each new rail to receive a corresponding deck bolt from below.

With the structure back in place, the steel springs were aligned and tied together with polyester twine following the pattern of existing twine. Points of attachment of the twine to the new frame were laid out by aligning their position along the axis of the original tack holes in the existing frame. Instead of tacking the twine into the new frame however, screw holes were drilled and 1-in. number 6 pan-head screws were inserted halfway into the rails to serve as tying posts. The screw threads closest to the heads were filed to prevent damage to the new twine, and the twine was secured and tensioned by wrapping around the shafts of the pan-head screws, pulling and driving the screws home. This allowed the twine to be adjusted and retensioned frequently during the spring tying process. The

Fig. 4. New rails, complete with T-nuts.

Fig. 6. Tensioning the twine.

position and tension of the springs were refined by adding 8-in. nylon cable-ties, rated for 75 lbs. of resistance between the springs as needed. As cable-ties were added while compressing the springs, the twine required frequent retensioning, which required backing off the pan-head screws and rewrapping the twine before finally driving them home. Using pan-head screws as tie posts is another element that allows for the structure to be completely disassembled easily if needed (figs. 4–6).

The next to last step was fabricating a bottom-deck of 0.25-in. mahogany plywood and attaching it to the secondary frame. Another template was created by piecing together the four rail templates for the shape of the deck. The location of the bolt holes were transferred from the frame to the paper template with an awl, and the plywood deck was cut out on a band saw. The bolt holes were transferred from the template to the plywood deck with the awl, and a series of ¼" bolt holes were drilled around the perimeter of the deck. A pattern of air holes was also drilled through the plywood deck to allow air within the seat cavity an escape when the chair is sat in.

Assembly of the secondary frame was completed by bolting the deck in place. The 0.25-in. diameter steel machine bolts pass through a large washer to spread the load and prevent the bolts from tearing through the attachment holes in the plywood when the seat is used, and the bolts are inserted through the rails and threaded into the T-nuts in the top of each rail. As the bolts are tightened, they draw the hanging brackets and deck together to grip the original frame in a sandwich, tying the new frame together vertically, supporting the springs, and completing the secondary frame. To complete an authentic appearance, the treatment was finished with traditional black cambric that was glued along the edges of the plywood deck with a bead of hot melt glue (figs. 7–10).

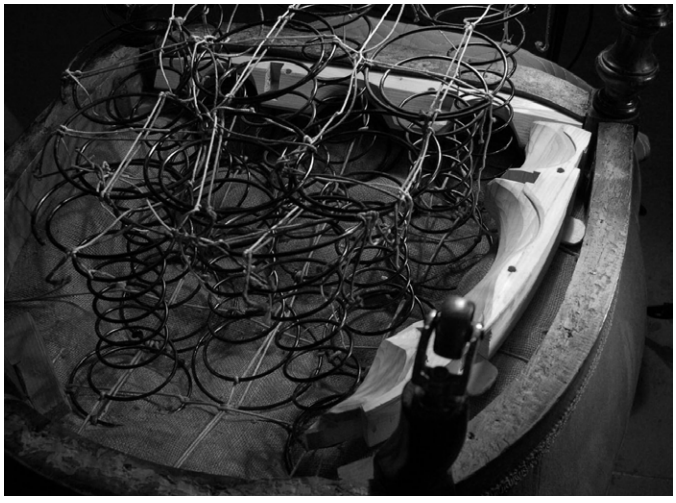

Fig. 5. Inserting the rails.

Fig. 7. Completed frame.

Fig. 8. Fitting the plywood deck.

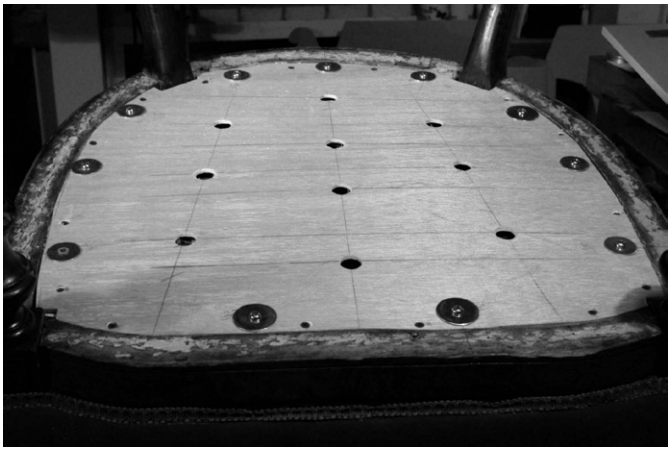

Fig. 9. With deck attached.

Fig. 10. Completed chair.

10. CONCLUSIONS

Certainly the problems of using collection objects in historic buildings persist in their increased wear and vulnerability to damage; however, the fabrication of a substitute, secondary upholstery frame can provide a very successful and nondestructive way to repair, support, and stabilize a failed sprung seat with enough structural integrity to withstand use if needed.

Creating a secondary frame for spring support eliminates the need to drive any additional metal fasteners into the original chair frame, overcoming the repeated cycle of collateral damage that is inflicted by traditional upholstery repairs. A secondary frame may provide an even more durable repair than destructive attachment to already damaged material, helping protect the object's cultural, aesthetic and material integrity, while allowing it to function more reliably if used. Ultimately, a substitute frame for supporting upholstery springs is an ideal conservation treatment for less-than-ideal circumstances, providing structural strength, improved stability, and minimally invasive repair and reversibility.

NOTES

1. Armchair appears in *Culture & Comfort; People, Parlors and Upholstery 1850–1930* by Katherine Grier, as figure 27, chapter 4, page 124. Advertisement for Gustav Sparmann "Iron Back Frames," originally published in *"Improved commercial directory and mercantile report combined, of the furniture, carpet and upholstery trades of the U.S. 1874–5*," appears as figure 26, chapter 4, page 123, ibid.

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2011 WAG Abstracts

Ethical Considerations in Reproducing Furniture for Historical House Museums

David Bayne, Furniture Conservator, Peebles Island Resource Center

The reproduction of furniture for a historic house is often desired to complete a historic furnishing plan. For example a set of chairs is incomplete or a table is missing that is crucial public understanding of the aesthetics of the period or of the family that lived in the house. The Furniture Conservation Lab at Peebles Island has commissioned reproductions for several houses in the New York Division of Historic Preservation (DHP). DHP has properties scattered around the state and that vary from 18th century manor houses to a Frank Lloyd Wright designed Prairie House. The problem is that not only is the furniture missing, but in some cases the documentation is fragmentary. It is desirable though that the reproduction be as accurate in all respects, including finish, as the original. How close is close enough or should it be more obvious? Does this though constitute a type of fraud or fakery? Beyond the curatorial needs are there other educational, research, and outreach functions that reproductions can achieve and do these additional considerations justify "faking it."

Making the Case for Conservation: Cultivating Pathos in an Ethos and Logos Intense Profession

F. Cary Howlett, President and Chief Conservator for F. Carey Howlett & Associates

Aristotle identified three pillars of persuasion in practicing the art of rhetoric: Ethos, Logos and Pathos. Ethos describes persuasion founded upon the character of the speaker, a function of esteem and credibility gained by a record of accomplishment, mastery of skills and demonstration of the highest ethical standards. Logos is an appeal to the rational mind, a sound argument based on critical thinking that leads to a logical conclusion. Pathos persuades by targeting the emotions, activating fear, indignation, a sense of well-being, pride, good will, pity or any other emotion intended to make a listener receptive to a particular idea or argument.

Analyzing the field of conservation, the attitudes of conservators, and the way we present our work within our institutions and to the outside world, it is apparent that we are in a decidedly ethos- and logos-intense profession. We place greatest value on our knowledge, our skills, our ethical standards, and our ability to use these in developing a sound, rational approach to caring for and treating artifacts. Pathos plays a much smaller role in our day-to-day function as conservators, as appeals to the emotions are often viewed as superficial or potentially deceptive. There is no question that most of us are passionate about our work. But if one stops to think about how we generally express that passion, it is nearly always in terms that, to an outside listener, probably smack of Ethos and Logos: trotting out our Code of Ethics, proclaiming the years of study and breadth of knowledge it takes to develop the judgment of a conservator, focusing on our fight against the forces of deterioration and emphasizing the role of science in our work. Hardly the Pathos Aristotle had in mind, and possibly one of the reasons conservators are sometimes marginalized as being "too analytical," "too rigid" in our thinking, and "unable to see the forest for the trees."

All three principles of rhetoric are important tools for conservators in communicating with curators, clients, architects, assistants, subcontractors, and any other individual with a stake in our work. The author examines several case studies in obtaining and managing large scale conservation projects (the conservation of woodwork and architectural interiors) and the ways in which attention to or neglect of rhetorical principles of Ethos, Logos and Pathos can contribute to success and failure. The case studies demonstrate that, although Ethos and Logos are important principles for effective communication of our work and our goals, Pathos—an appeal to the emotions—can be the deciding factor in the success of a project.

Philosophy Regarding the Preservation of Watercraft at the Mystic Seaport Museum

Dana Hewson, Clark Senior Curator for Watercraft, Vice President for Watercraft Preservation & Programs, Mystic Seaport

Traditional wooden vessels are complex structures usually comprised of coatings, several species of wood and different metals. Often these vessels have been exposed to decades of seasonal or year round use in salt or fresh water. Additionally many ships and boats have engines, mechanical systems, plumbing systems, and electrical systems.

This talk will present an overview of the problems involved with the preservation of the Watercraft Collection at Mystic Seaport. These complex objects that can range in size from the smallest of rowboats (7–8 ft) to the Charles W Morgan (109 ft, displacing over 300 tons) present many challenges. Watercraft stored or exhibited indoors as well as vessels exhibited and used will be discussed.

Preserving Wooden Materials in Isolated Environments: Considerations and Challenges

Susanne Grieve, Acting Director of Conservation, East Carolina University

Throughout history, humans have attempted to accomplish the impossible and to explore unknown places. In many cases, after the expeditions are done or equipment is no longer needed, it is discarded or left in situ, undisturbed. With the changes in the environment, explosion in population, and the expansion of technology, more of these desolate and isolated environments that contain cultural heritage are becoming exposed and, in many cases, used by humans and protected wildlife. Conservators and preservation specialists are facing new ethical and practical challenges to ensure the delicate balance of preserving material culture while considering the effects of the environment are maintained. Many of these objects from human history are constructed of wood and are deteriorating as a result of human and environmental actions. This presentation evaluates conservation efforts of wooden materials in isolated environments and seeks to answer the question of why we preserve them when there are so many challenges.