

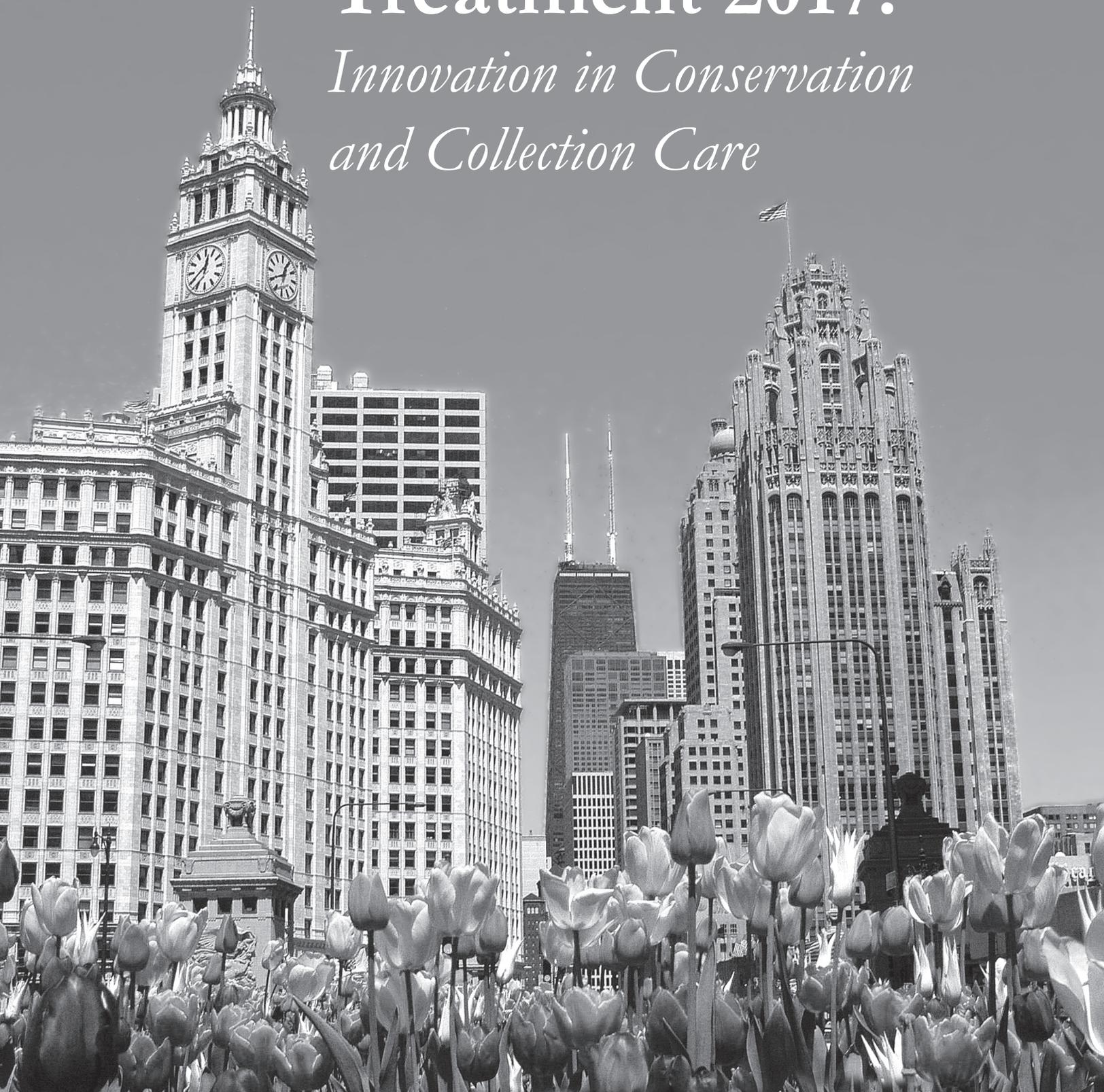
ABSTRACT BOOK

45th Annual Meeting  
Hyatt Regency Chicago  
May 28-June 2, 2017

AIC

American Institute for Conservation  
of Historic and Artistic Works

Treatment 2017:  
*Innovation in Conservation  
and Collection Care*



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# 2017 Abstract Book

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The American Institute for Conservation of Historic & Artistic Works (AIC) is the national membership organization supporting conservation professionals in preserving cultural heritage by establishing and upholding professional standards, promoting research and publications, providing educational opportunities, and fostering the exchange of knowledge among conservators, allied professionals, and the public.

The Foundation of the American Institute for Conservation of Historic and Artistic Works (FAIC) supports conservation education, research, and outreach activities that increase understanding of our global cultural heritage. Its mission is to elevate the vital role of cultural heritage conservation by applying its expertise to urgent global preservation initiatives while empowering conservation professionals, motivating collecting institutions, and engaging the public.

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# 45TH ANNUAL MEETING

## Treatment 2017: Innovation in Conservation and Collection Care

*May 28 – June 2, 2017 at the Hyatt Regency Chicago in Chicago, Illinois*

Whether item or collection-level, preventive or interventive, treatment remains at the heart of what conservators do in order to preserve cultural heritage collections. The design and implementation of an ethical and sound conservation treatment, even the ultimate decision of no treatment at all, begin before its commencement and the consequences continue well beyond its completion. Papers were solicited that explore various facets of conservation treatments and collection care programs intended to prolong the lifetime of cultural property. Topics include, but are not limited to, a reconsideration of historic procedures no longer in practice, cutting edge technologies employed in treatments, effective preventive conservation or collection care steps that reduce the necessity or extent of interventive treatments, the incorporation of sustainability into conservation treatments, or innovations in treatment design, execution, and documentation.

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## *Opening General Session*

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### **Revision & Reflection: The conservation/restoration project of the Ghent Altarpiece**

*Bart Devolder*

In October 2012, the Royal Institute for Cultural Heritage began a five-year conservation/restoration campaign for the Ghent Altarpiece painted by the Van Eyck brothers (1432). After an extensive preliminary study in 2010 it was decided that the main focus of the project would be a conservation treatment carried out in three phases rather than a comprehensive restoration. This treatment would take place in front of the public in the Museum of Fine Arts Ghent (Belgium) where an exhibition gallery was redesigned as a conservation studio. With the first phase finished (two years behind the initial schedule), we can look back on how this conservation treatment took a completely different turn after the varnish removal.

The paper will focus on how, although a comprehensive pre-study was conducted, unforeseen findings resulted in a reconsideration of the scope of the project. What are the implications when one changes course mid treatment? How do you challenge decisions that were made well before the conservation team was assembled? How to neutrally address significant financial and timing consequences to all the different stakeholders, when the conservators are challenged on what the outcome of the revised treatment should be? What is the impact of these changes for the future two phases of the project?

These thorny issues will be addressed by the author's personal experiences in these unique circumstances as the projects on-site coordinator for the past four years. This case study could be of particular interest to the American conservation community, as strict oversight from multiple entities (both religious and political) is a more common occurrence in Europe.

### **When an Airplane Acts Like a Painting: Applying established conservation methodologies to ephemeral aircraft materials**

*Lauren Horelick, Malcolm Collum*

Large scale, functional material culture has long suffered the onus of being considered somewhat exempt from established stewardship practices. This is primarily the result of the impracticalities and fiscal limitations of caring for macro artifacts but also the deference that most conservators have paid to traditional restoration practices. This paper will illustrate one example of how a conservator's understanding of materials and modes of deterioration has altered long-established practices for treating ephemeral materials.

Doped fabric is not often found in the fine art world, but is ubiquitous to the collection at the National Air and Space Museum (NASM). Doping is the practice of applying a waterproof

coating to fabric which also serves to shrink the material over a rigid structure. A doped surface is traditionally made of multiple coats of clear cellulosic resins with light blocking layers and final decorative finishes over a cotton or linen fabric.

Because of the inherent chemical instability of the cellulosic resins and the requirement for scheduled inspections of the structures beneath, doped fabric materials have long been considered to be dispensable and expected to be replaced during routine operational maintenance or during a restoration. However, when viewed as a multi-media artifact with inherent preservation challenges similar to those in other realms of conservation, a new approach can be devised. Comparing the similarities and recognizing the differences between doped fabric structures and canvas paintings inspired a new treatment methodology for preserving historic aircraft fabric.

This concept represents a major departure from the long-standing restoration traditions at NASM. A new approach to preserving doped fabric structures will be illustrated through the treatment of the control surfaces on a World War Two Martin B-26 Marauder, named "Flak Bait." The case study will detail materials analysis, decision-making processes, encountered problems and solutions, loss compensation and varnish selection. It will also emphasize how the benefits of cross-disciplinary collaboration, coupled with practical research has influenced these innovative and adaptive treatments and altered established methodologies.

### **Preventive Conservation in the Renovation of the Harvard Art Museums: Before, during, and ever after**

*Angela Chang, Penley Knipe, Kate Smith*

The Harvard Art Museums reopened in 2014 after a six-year renovation and closure. Conservation involvement in the planning of this building project influenced all art-related spaces, processes, and procedures. This talk reflects on the question: what is the role of conservation in a museum renovation project? The success of conservation initiatives relies on effective collaboration, predominantly with professionals outside our field. We must cultivate trusting relationships with museum colleagues to get approval, support, and funding.

This talk will share three projects from the Harvard Art Museums' renovation that demonstrate preventive conservation practiced through communication and collaboration: a large scale materials testing program, the integration of light sensitive materials throughout new galleries, and a program of gallery art incident tracking and response. Each program demonstrates the importance and power of collaboration in preventive conservation. A materials testing program was devised for the design and construction of two consecutive major building projects, totaling 77,000 square feet of art spaces. Conservators, conservation scientists, and administrators played integral roles in the design and planning process. They devised a materials testing program, primarily using the Oddy test, to review all construction materials proposed first for an interim facility and then for the renovated the

## GENERAL SESSIONS

Harvard Art Museums. The program sought to minimize harmful off-gassing of construction materials by making the best choices of materials where possible, understanding that concessions would be necessary. Over eight years of testing, 900+ materials were evaluated for use. Lessons learned will be shared about this ongoing program.

A new curatorial directive to integrate light sensitive materials throughout the museum's galleries (43,000 square feet) prompted the need for clear guidelines on exhibiting, lending, and teaching with light sensitive materials. While conservators initially perceived this charge as being in tension with the light-focused architectural design by Renzo Piano, they worked closely with architects and lighting engineers to understand the predicted effects of natural light in a building with 9500+ square feet of glass and to plan for optimal control of natural light with a system of 450+ operable and fixed shades. Conservators then developed and implemented a light monitoring program that measured light levels at 40 points throughout a full year to verify the predicted light effects, prescribe shade programming and focus on problematic areas.

In response to concerns about visitors' frequent contact with art on view in the museum's intimate gallery spaces, a simple, collaborative program devised by Conservation, Collections Management, Security, and IT tracks and responds to gallery art incidents. With their standard duties, the museum's 46 security attendants record minor and major incidents on "Art Touch Cards." The notes are compiled and the aggregate data is analyzed by a cross-departmental team, which identifies and diagnoses the objects suffering the most frequent incidents. The museum has made effective changes in response to the analyses, and the impact has been measurable. In addition to reduced incidents, the program has improved upkeep of non-art conditions in galleries, and, surprisingly, staff engagement.

### What Would Anselm Do? Revisiting the treatment of *Osiris and Isis*

*Paula De Cristofaro*

The San Francisco Museum of Modern Art acquired *Osiris and Isis*, an important mid-career painting by Anselm Kiefer, in 1987. SFMOMA recently re-opened after a major expansion to accommodate the Fisher Family Collection of 20th century art, which includes masterworks by Anselm Kiefer.

Anselm Kiefer's oeuvre examines history and culture by means of incorporating potentially unstable and problematic materials (including straw, lead, found objects and industrial media). Kiefer's works are often oversized, extremely heavy, fragile and vulnerable; they challenge the norms of stewardship. *Osiris and Isis* exemplifies Kiefer's use of mixed techniques and found objects, which are included in a composition of massive size. The painting has required treatment intervention at regular intervals since its acquisition.

This presentation will trace the trajectory of care *Osiris and Isis* has received over several decades. Treatments of the painting which did not age well over time will be discussed. A cross-disciplinary

treatment which would have deviated from standard practice was recently considered. The proposed treatment for the painting was revised after the artist was brought into the discussion. A relationship of trust between SFMOMA, Kiefer and his studio was created once Kiefer became involved with the project.

SFMOMA's engagement with artists can provide guidance for the care of artworks and serves as a starting point for successful museum activities involving the Museum's Artist Initiative, Curatorial, Collections and Education programs.

We now have a much better understanding of "what Anselm Kiefer would do" when concerns and questions arise regarding the conservation and exhibition of his works. As we continue our dialog with the Kiefer studio, we plan to carry out more in-depth study, research and treatment of the SFMOMA/Fisher Kiefer Collection.

### Henri Matisse: The cut-outs

*Karl Buchberg*

In 2014, The Museum of Modern Art opened a landmark exhibition centered on the final chapter of Matisse's long career, the cut-outs. The largest Matisse cut-out exhibition ever mounted, it had as its central work one of MoMA's most beloved attractions, *The Swimming Pool*. This large, room-sized cut-out was not only the centerpiece of the exhibition, its conservation was the genesis of the show. This exhibition was the first time that a conservator at MoMA, Karl Buchberg, was also a curator of an exhibition; sharing this title with Jodi Hauptman, Senior Curator of Drawings and Prints.

*The Swimming Pool* was created in 1952 in the dining room of Matisse's Cimiez-Nice apartment. Matisse's assistants would paint sheets of paper with Linel gouache which were then dried and stored. When Matisse wanted a particular color, a sheet would be brought to him which he would then cut into a desired shape. A studio assistant would then take the cut shape and pin it on the studio wall according to Matisse's instructions. *The Swimming Pool* consisted solely of ultramarine blue painted paper shapes on a frieze of white Canson paper pinned to the burlap lined walls of the dining room. After his death in 1954 it was permanently mounted by the Parisian firm Lefebvre-Foinet. The work was divided into nine panels; the blue shapes were adhered to the white paper frieze which was then adhered to new burlap, chosen by Matisse's widow as it was the only fabric faithful to the original conception.

When MoMA acquired the work in 1975, the white paper was stained, the ultramarine blue shapes were unevenly decolorized from the contact with the acidic burlap and the burlap itself severely darkened. My predecessor, Antoinette King, removed the staining in the white paper during a lengthy treatment. The blue cut-outs and the burlap were not treated. In 2009, I decided to carry out a treatment with three goals: to replace the discolored burlap to return the work to its original color balance, to increase the height of the new panels to re-create the original dimensions of the work and to re-install the work in a room that re-created the original floor plan. Although the white paper frieze was not

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original – it had been newly added during the first mounting – I chose not to replace it. It was approximately the same age as the blue cut shapes and had a similar patina. The most radical decision was not to re-adhere the white frieze and blue cut shapes on new fabric, but instead to pin them on the newly fabricated panels. This re-created the original pinned aspect of the work and minimized any further acid induced damage.

This paper aims to describe the treatment choices for this work and illustrate how these choices came to inform the cut-out exhibition as a whole, highlighting the relationship and collaboration between conservator and curator.

### *Discussion Session*

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#### **Socratic Dialogue: High-tech innovation in conservation and collection care - do we need a better high-tech mousetrap?**

*Speakers: Dr. W. (Bill) Wei*

Digitalization, advanced analysis techniques, new treatments and new materials, collection mobility, and globalization. The conservation world is dealing with rapid developments, which are affecting how conservation decisions are made and how treatments are being carried out. Conservation has certainly come a long way in the last decades thanks to advances in treatment techniques developed in private and museum practice, and to new developments in conservation science. These advances and innovations will be discussed at the 2017 AIC annual meeting, with its theme “Treatment 2017: Innovation in Conservation and Collection Care.”

Innovation is fine, but most conferences and the literature are seeing ever increasing numbers of presentations of the latest in so-called high-tech developments and innovations such as atomic force microscopy, computer simulations, cryo-treatments,

electrochemical cleaning, laser cleaning, multi-spectral imaging, nano-technology materials, plasma treatment, synchrotron radiation, and virtual retouching. We all look with wide-eyed wonder at what all of these techniques supposedly can do and how they can help in a rapidly changing conservation world. However, many of these techniques are quite expensive and/or out of reach for most private conservators and smaller museums, let alone that we understand how they work.

Do we really need all of this high-tech innovation and what for? Is it all good, ethically and/or technically? What is wrong with low-tech innovation, or sticking with traditional ways of analysis and treatment, which have long been successful? Do we really need a better high-tech mousetrap? These questions are part of a classic debate which still rages between tradition and innovation, practice and academics, low and high-tech, or however one wants to characterize it.

Although there is no clear-cut answer to the questions posed, an understanding of the issues and essence behind the questions and debate would certainly help us to determine what advances in analysis and treatment we need, and where we want to go with innovation. A so-called Socratic dialogue is an ideal way for doing this. In the continuing series of such dialogues at AIC annual meetings, a Socratic dialogue will be conducted looking at high-tech innovation in conservation and collection care. A Socratic dialogue is a structured form of dialogue in which all participants actively contribute. The purpose of the dialogue is not to solve the question at hand, that is, do we need all of the high-tech innovation that is being offered, but to investigate each other's experience, opinions and concerns on high-tech innovation, and its value in conservation and collection care. The Socratic method provides a safe, open environment for participants to investigate what the essence behind these issues is, and to understand their own points of view as well as those of others. It provides a solid foundation for thinking about how we deal with new developments in conservation and collection care, and making decisions on their use.

*Treatment: Going Big*

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**Go Big or Go Home: Broader considerations in the treatment of oversize objects at the Art Institute of Chicago**

*Rachel C. Sabino*

Whether in the private sector or within institutions, conservators seem to be under increasingly urgent and constant pressure. Exhibition schedules and treatment deadlines are drawing ever tighter with ever-fewer resources—both material and personnel—allocated to satisfy these demands. At times, certainly, realizing even a minimum level of treatment feels like an impossibility. Over the past several years, various initiatives at the Art Institute of Chicago have necessitated major re-treatments of several oversize works of art: a pair of 17th-century Islamic tile spandrels; a Renaissance terracotta altarpiece; and a Classical Greek marble funerary monument. The treatments themselves were of considerable interest, requiring investigation into new materials and techniques; exploiting trusted materials from the conservator’s arsenal but utilizing them in novel ways; and demanding ample bench skills. These aspects of each treatment will be discussed.

However, the more salient theme that the three campaigns will highlight is the degree to which the treatment design for each object went beyond the strictures mandated by the profession (i.e., retreatability, minimal intervention, etc.) and incorporated the broader exigencies of numerous staff members outside of conservation. For instance, a specific goal of each treatment was to ensure that installation be as straightforward and expedient as possible. A further goal was to reduce the object’s footprint within available storage space in the event of its being taken off view. Not least, the treatment design incorporated sound shortcuts to accommodate the project deadlines as closely as possible. These and other goals will be enumerated in greater length to reinforce the notion that it behooves conservators to think beyond the bench and tailor treatment designs to dovetail neatly with the needs of clients or the institution as a whole.

In the face of dwindling budgets and burgeoning administrative hurdles it makes increasing sense to function as collaborative partners with a full understanding of how conservation fits into the bigger picture. At the same time, the three objects serve as good case studies for discussion as to the extent of treatment and when it is critical to insist on wholesale re-treatment. The reservoir of goodwill that builds from a track record of problem solving, not just for the benefit of the objects in our care, but on behalf of the many other members of staff whose work may appear tangential but is nonetheless allied with our own, makes it easier to hold the line and push for those treatments which might not otherwise have full support or the luxury of undivided attention.

**When What Went Up Must Come Down: Triage treatment and disassembly of two 15th century Chinese mud plaster murals**

*Emily Brown, Madeleine Neiman, Lynn Grant*

In the spring of 2016, two monumental, mud plaster murals (~20ft. x 30ft.) at the University of Pennsylvania Museum of Anthropology and Archaeology underwent stabilization treatment and deinstallation. During the early twentieth century, each mural had been cut away from the walls of a Buddhist temple in Central China and removed to art dealer C.T. Loo’s Paris atelier for mounting and restoration. The panels were subsequently purchased by the Penn Museum and installed in the Rotunda gallery in the late 1920’s. After approximately 90 years on view, the murals displayed a range of condition issues including friable and powdering substrate, bulging and delaminating surface, as well as a heavy layer of dirt and grime over a thick, white shellac coating.

Prompted by the impending demolition and construction at a site immediately adjacent to the museum, conservators were allotted 6 months to plan and complete this daunting project. The goal of this paper is two-fold: First, to present the dynamic inter- and intra-disciplinary collaboration by Penn Museum conservators to design the treatment methodology, including collaboration across specialties (objects, painted surfaces, and architecture) as well as with allied museum professionals (registrars, collections managers, and riggers); and second, to present as a case study the demanding, in-situ, triage treatment and dismantling of two monumental, unique museum artifacts. Specifically, we will describe the treatment process of gel cleaning, consolidation, and facing used to stabilize the surface, as well as the rigging and packing methodology employed to prepare the panels for movement to offsite storage.

**Puvis de Chavannes’ *Philosophy*: Condition issues and strategies for the removal of a severely detached mural, its conservation treatment and remounting**

*Gianfranco Pocobene, Ian Hodkinson*

This paper describes condition issues and strategies for the treatment of Puvis de Chavannes’ *Philosophy* mural, one of nine canvasses at the Boston Public Library. Painted by the artist in France on linen canvas, the 14’ x 7’ mural was shipped to America and marouflaged to the plaster wall with a lead white in linseed oil adhesive in 1896. For more than half a century, intermittent moisture infiltration had caused gradual partial separation of the canvas support from the plaster. In 2015, however, it was discovered that 80% of the canvas had completely detached. Furthermore, failure of a large section of plaster and metal lath support near the top of the mural was exerting outward pressure on the already loose canvas causing it to sag downwards, forming large undulations and a severe bulging crease. Left unchecked, collapse of the plaster would have ultimately led to catastrophic damage including tearing of the canvas and extensive paint loss.

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Any potential structural intervention to treat the mural was complicated by a number of factors. The mural is set within a marble faced niche making access to the edges of the canvas difficult. During the initial examination, attempts to detach the portions of the canvas still attached to the plaster using a micro-spatula revealed that both the paint and canvas are extremely brittle. The deteriorated condition of the plaster and other factors precluded the possibility of re-adhering the loose canvas to the wall. Although several structural treatment options were considered, it became evident that removal of the mural from its niche was necessary. It was recognized from the outset that the procedures required to perform such work would be complex, challenging and not without considerable risk. The brittleness of paint, ground, canvas and lead white adhesive excluded the possibility of detaching the mural at the interface between the canvas and the wall. Moreover, the strong bond between the undetached canvas and plaster along the left and bottom of the mural dictated that a partial *stacco a masello* process be employed, all the while, keeping the canvas intact and minimizing paint loss.

The mural was first faced with Kozo tissue adhered with UVLS artist's varnish emulsified with a small amount of water followed with linen canvas adhered with the same adhesive fortified with BEVA Gel. The plaster was then severed from the bottom up while lightweight rigid support panels were progressively attached to the face of the mural and locked together to form a continuous solid support. Once it was completely detached, the mural was lowered face down and transported to a work space in the Library. There, removal of plaster from the reverse of the canvas was carried out followed by removal of facings, lining of the mural onto an aluminum honeycomb panel and reinstallation in its niche. The discussion will focus not only on the successes of the treatment but also underline the challenges and problems encountered during the project and aspects of the process that warrant improvement.

### **Textiles as Architecture: Raising a royal Persian tent**

*Robin Hanson*

In late 2014, the Cleveland Museum of Art acquired a royal Persian tent that can be dated to the second quarter of the 19th century, as it is signed with the name of Qajar ruler Muhammed Shah (reigned 1834-1848). Measuring roughly 4.1 m (13-1/2 feet) in diameter and 3.5 m (11-1/2 feet) in height, the entire roof including exterior valance is extant, as are seven of 14 wall panels. Missing are seven wall panels, the top "register" of the seven extant wall panels, an interior valance, and the central pole and struts. Only the tent interior would have been decorated, in this example entirely of Rasht work, a technique executed in heavily felted plain-weave wool and named after the town on the Caspian Sea where the technique originated. The exterior of the roof and wall panels originally would have been undecorated, plain-weave red cotton. Reflecting the theme of AIC's 45th Annual Meeting – innovation in conservation treatment and collections care – this presentation will address that continuum as it relates to a large, three-dimensional textile that is as much architecture as it is textile. Complementing two tent

presentations at the November 2015 NATCC meeting in New York, this one will focus on the perspective of a fine arts museum acquiring, treating, displaying, storing, and potentially lending a rare royal Persian Rasht tent.

The tent arrived in Cleveland in March 2015 and was displayed in the Arlene M. and Arthur S. Holden Textile Gallery beginning in July 2015. During that interval, a mount was fabricated that allowed the front half of the roof to cantilever, offered visitors an uninterrupted sightline, and encouraged them to enter the tent. The mount had to balance original intent and conservation concerns – the tent roof supporting the wall panels as opposed to the mount supporting the wall panels. In addition, a base was fabricated, lighting designed, and conservation treatment undertaken. The collaboration between conservator, mount maker, cabinet maker, lighting designer, exhibition designer, and curator that resulted in this successful installation will be detailed. The tent was deinstalled in August 2016. A storage container for the tent roof and modular mount components was fabricated to ensure safe storage of this very large object. Additional treatment of the tent roof will be undertaken in winter 2017, and the modern navy blue wool lining on the wall panels replaced with custom woven and dyed plain-weave cotton to match the tent roof. These activities also will be discussed. During the brief window for treatment in June 2015, several discoveries were made about the tent, which informed subsequent decisions. These discoveries also will be shared. Finally, questions remain about re-creating an interior valance. No design evidence exists for this tent element, raising ethical questions as to how and if that element should be reconstructed.

### **Resurrecting della Robbia's *Resurrection*: Challenges in the conservation of a monumental Renaissance relief**

*Sara Levin, Lisa Bruno, Nicholas Pedemonti*

The *Resurrection* (c. 1520-24) by Giovanni della Robbia, a large-scale glazed terracotta relief, was on view at the Brooklyn Museum since the late 19th century. However, contemporary renovations of the galleries and aging restorations relegated the artwork to storage in recent decades. With its inclusion in the August 2016 show "Della Robbia: Sculpting with Color in Renaissance Florence" at the MFA, Boston, the object was slated for its first full-scale treatment since being acquired in 1899. Examination, disassembly, cleaning, reassembly, inpainting and remounting of all 46 sections of the relief was completed in just ten months, involving the participation of 12 objects conservators, the Museum's mount maker and art handlers.

This paper will discuss treatment approach, challenges posed by the extant mounting materials, and the development of a new mounting system. It will also highlight observations about Giovanni's workshop techniques, the use of TL dating and multi-spectral imaging to learn more about the materials present. Working as a team under a tight deadline is a challenge that many conservators face. The large scale of the project forced conservators to be innovative in their approach and design the treatment

## CONCURRENT GENERAL SESSIONS

to maintain consistency while remaining flexible when unique challenges arose. Many treatment decisions confronted compromising questions such as: which 19th century restoration materials should be kept as part of the object, saved separately as samples, or discarded? How should the historic backboard be treated if it is still to function as an adequate support? When is it appropriate to treat one section of the object uniquely from the others? Addressing these concerns required thorough understanding of the materials and history of the object drawing from comprehensive examination and analysis.

Discoveries about original workshop techniques are also important as much of the literature related to the della Robbia workshop focuses on the earlier generations, Luca and Andrea. Observations include the use of two different types of clay; original repairs made with glaze visible on the verso; sketches incised in the clay; and evidence of hand-modeling and coiling techniques. Close examination also revealed a wide extent of gilding and cold-painting, much of which has been lost over time. Multi-spectral imaging illuminated subtle patterns on the two main figures of the relief—Christ and the patron, Niccolò Antinori not visible in normal light. Due to the in-depth nature of intervention required and the many hands at work, organizing the treatment required customizing the system of documentation. Consistent protocols were developed to address past restorations, establish conservation materials, degree of intervention, and aesthetic compensation. The new mounting system retrofitted the wood backboard that has been with the object since it arrived in the United States, with high density form-fitting inserts that support the terracotta elements from the back. Remounting was one of the most difficult, innovative and challenging processes of the treatment, and as such strategies used to find the correct spacing and order of installation of pieces may be helpful for conservators working on similar types of objects in the future.

### **Gilding the Lily? The conservation treatment of Alexander Calder's *Red Lily Pads***

*Nathan Otterson, Tracey Bashkoff, Carol Stringari, John Vitagliano*

*Red Lily Pads* (1956) is a signature work in the Solomon R. Guggenheim Museum Collection purchased from the Perls Gallery during the exhibit "Alexander Calder: A Retrospective Exhibition," which opened at the museum in late 1964. Calder installed the work directly above the oval tiered fountain in the spiraling rotunda of the Frank Lloyd Wright-designed building, initially so low that visitors had to push the mobile out of the way to precede up the first ramp and view the rest of the show. The work was rehung at a reasonable height shortly after the opening but the location still proved problematic. Over the fountain, the paint was repeatedly damaged by coins, which visitors meant to toss into the fountain. In 2013, the Conservation Department of the Guggenheim Museum received a generous grant from Friends of Heritage Preservation and the John and Mary Shirley Foundation to conserve this important work.

Treating damaged paint on Alexander Calder's indoor mobiles has long been a topic discussed among curators and art

conservators alike. The flat matte paint, which Calder thinned with turpentine and applied without a primer, is easily damaged. Alexander Calder did not leave specific instructions for conservators as to how best to care for his kinetic sculptures. Correspondence exists where the artist describes repainting but what should be done when this approach is no longer viable, since repeated overpainting will eventually cause excessive paint build-up and a compromised appearance. In the past, several treatment approaches have been adopted to solve this dilemma: traditional retouching, toning with a colored reversible layer, as well as repainting, after complete removal of all existing paint layers -- including Calder's original brushed application. This paper will address the Guggenheim Museum's research, thought process and conservation treatment of *Red Lily Pads*. Research discussed will include national and international comparative site visits, analysis of paint layers and analysis of Ronan Japan Color reds, the paint most commonly used by the artist. The paper will also include an overview of treatment method, which utilized a custom retouching system formulated by Golden Artist Colors, Inc.

### *Beyond Treatment*

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#### **What's so Ethical About Doing Nothing?**

*Jonathan Ashley-Smith*

This conference is a celebration of the importance of treatment and of the necessary intellectual preparation for action. In the description of the conference theme the "no treatment at all" option is referred to as "the ultimate decision." Yet there seems to be a growing trend within the conservation profession for "no treatment at all" to be considered the one and only ethical choice.

There are several reasons for this trend. One of the causes concerns social and academic attitudes to working with the hands. The academic professionalization of conservation can aggravate the prejudice that intellectual skills are more desirable and laudable than manual dexterity. Most conservation treatments demand both types of skill in equal measure. Yet if time is not allowed in school and college for the development of manual ability, practical intervention tasks will not be carried out with the necessary speed and skill. This may lead to mistakes and irreversible damage to artifacts. This leads to a process of ethical drift where certain treatments are deemed unethical rather than just difficult, downright wrong rather than requiring skill and experience.

College conservation courses fill their curricula with more and more non-practical content. Specialist conservators in large institutions fill their time with administration and with short-term activities such as loans, ostensibly to reduce immediate risk. They engage with storage projects with long-term aims of preservation and risk reduction. Conservators in smaller museums cannot hope to specialize. This leads to the development of members of the conservation profession who have not learned, and do not desire, to carry out interventive treatments.

Arguments that preventive conservation is more economical

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and less risky than intervention seem to generate unwarranted attitudes of moral superiority that can fuel the ethical drift. This drift means that treatment options that were considered perfectly allowable become at first questionable and then unethical. This is excused as the necessary progress of a developing profession. In extreme cases the supremacy of the “no treatment at all” policy could be construed as “depraved indifference” to the aesthetic and educational potential of individual objects.

There is a concurrent trend in the wording of codes of conduct and ethics that no longer include explicit guidance about practical intervention. The limits of intervention are blurred, yet conservators continue to act as though they were following unequivocal and universally acknowledged guidelines. Sensible elegant solutions to problems are deemed to be both sensible and elegant but “not what a conservator would do.”

This presentation will provide evidence of this trend and discuss the limits of arguments about the safety and economy of doing nothing. A process will be proposed that will promote discussion of the full range of options and allow the construction of explicit policies for interventive treatments. These will be locally determined and locally relevant. Any national or international body attempting to regulate conservation practice need only insist that this policy has been discussed, locally approved and made universally accessible.

### **Active Conservation Treatments and Virtual Retouching: What do people actually see?**

*Dr. W. (Bill) Wei*

The aging and discoloration of objects eventually lead to changes in their appearance and a loss in materiality and value. Active conservation treatments are meant to bring them back to some acceptable condition. However, at some point, an object is considered a “total loss” because it can no longer be treated according to accepted conservation ethics. Virtual retouching techniques have been shown to be a promising method for the non-invasive treatment of objects, allowing total-loss objects to be exhibited again, or at least to help conservators visualize treatments before making treatment decisions.

With the use of corrective color lighting, at least some semblance of the original color or color balance in an object can be brought back without physically altering the object surface. Still, even with non-invasive virtual retouching, critical questions are being raised about what the acceptability of a virtually retouched appearance is. For example, various articles about the virtual treatment of five Rothko paintings at Harvard University show the diversity of opinions, ranging from the initial enthusiastic “Wow!” effect, to discussions about site-specific works, or the disturbing reflection of corrective light from a painting which produces its own light (New Yorker 2015).

The Cultural Heritage Agency of the Netherlands (RCE) is examining these issues of acceptability and perception within the framework of research on the local virtual retouching of objects, that is, where only part of the object has changed. Case studies, perception tests, and eye tracking experiments are being used to

determine what people actually see in a work of art before and after treatment. In an initial set of tests, subjects with widely different backgrounds were asked to look at two works in an exhibition setting, a virtually treated portrait by Van Gogh, “The Old Arlésienne,” and an untreated mixed-media work by the contemporary Dutch artist, Ger van Elk, “Adieu,” considered to be total loss. Further, subjects were asked to look at several solutions for the active or virtual retouching of a monochrome painting by the Dutch artist, Jan Roeland. For the Van Gogh and Roeland works, they were asked to evaluate the treatments. For the Van Elk work, they were simply asked to describe what they saw. In all three cases, no introductory information was provided. The results show that while descriptions and opinions differ widely as expected, explanations for the differences cannot be simply categorized into technical exhibition conditions or personal background. In fact, in the case of the Van Gogh painting, a small but significant number of subjects including both professionals and non-professionals did not even see the changes due to the virtual treatment which they were meant to see. Such results clearly have implications for the role of virtual retouching methods in conservation, but also for traditional forms of active conservation. Further work is being carried out to determine whether virtual retouching is an acceptable method for exhibiting locally aged works of art, or more an important tool to help conservators visualize and make treatment decisions.

### **In Support of the Bigger Picture: Preventive conservation as a recognized specialty**

*Elena Torok, Meg Loew Craft*

In recent decades, preventive conservation has become an increasingly larger and better defined part of every conservator’s job. Innovations in environmental monitoring, pest management, archival materials, and overall collections care have enabled conservators to prevent damage or loss of cultural heritage more holistically, more sustainably, more economically, and on a larger scale than ever before. This growing body of knowledge has caused the field to rethink preservation, as preventive conservation action in the present can reduce the amount of interventive treatment needed in the future. This growth has been reflected internationally in both conservation-related education and membership groups. Many training programs in Europe and the U.K. now offer student specialization in preventive conservation, and at least one training program in the U.S. is planning to add it as a specialization soon. Preventive conservation sub-groups exist in the ICOM-CC, ICON, and now AIC with the recent founding of the Collections Care Network. Will we ever acknowledge and respect preventive conservation as its own independent specialty?

Preventive conservation is developing as other specialties have historically; most recently, photography and electronic media grew from paper and became their own specific areas of concentration. Some practicing conservators have moved to become consultants focusing on museum environment, storage facilities, exhibition or conservation planning and surveying – yet may or may not already call themselves preventive conservators. Can one

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still be accepted as a conservation professional, even if they don't do hands-on treatment? At present, the AIC accepts many individuals who do not actively treat objects as conservation professionals, such as scientists, educators, and administrators. But other non-conservators share and engage in critical types of conservation activities, too. Can collection managers, registrars, art handlers, curators, and architects also be included as members of AIC so they can share in the many benefits that professional membership has to offer? Conservation has many parts that enable the whole to function, and all specializations are equally important. Treatment-based activities would not be effective without preventive-based activities, and vice-versa. It is important that conservators support one another in the common goal of preserving art and cultural heritage. This paper will discuss what should define a preventive conservator, the status of preventive conservation in AIC, and the wisdom of including preventive conservation specialization in conservation training programs.

### **Cross Platform Use of iPads in Stained Glass Conservation Treatment & Documentation**

*Ariana Makau, Greer Ashman, Chloe Castro*

Historically stained glass conservation has used paper documentation. But, the level of complexity in working on monumental windows, as well as our increased team size led Nzilani to develop a real-time digital documentation system using iPads.

Our upgraded documentation system includes using an in-house customized app on iPads to document our work onsite (translated instantaneously to the studio team via the internet). Base documents are then updated and used as reference throughout the treatment process, and eventually become our final treatment books with less reformatting than before. All information gathered and updated throughout the project is easily translated into final formatting software to create a finished and polished treatment document with much more detail and quality than before... and in less time.

### **That Poor Cousin of Treatment: Documentation and possibilities for simple innovation**

*Cybele Tom*

Treatment of artworks and artifacts forms the core of a conservator's responsibilities, but accompanying every modern-day treatment is some form of documentation. Documentation informs future decisions affecting the artwork in aspects such as its significance and meaning, insurance and provenance, and of course, exhibition and treatment. Moreover, as some recent cases involving contemporary art have shown, documentation can itself constitute treatment. Therefore, as one of the key tenets of modern conservation ethics, the practice of documenting artworks and their treatment shares the importance, if not the limelight, of benchmark.

This paper looks at common methods of documentation with

a critical and practical eye, using a treatment case study to assess their efficacy in transmitting information accurately across time, institutions, and people. The treatment, recently conducted at the Art Institute of Chicago for its newly opened medieval and Renaissance galleries (March 2017), is the comprehensive removal of overpaint from a quattrocento polychrome relief--begun, interrupted, and ultimately completed three decades later by a different conservator (the author). The documentation of treatment, also spanning three decades, provides fertile ground for harvesting tips and fodder for thought.

The heart of the paper is divided in three sections. First, specific features of the old documentation that proved helpful to the recent phase of treatment will be identified. On the other hand, its unintended consequences, ways in which it primed the author's treatment decisions and led to misunderstanding, will also be discussed. Second, the paper describes ways in which the author sought to document difficult treatment decisions as well as major changes in the artwork during treatment. Simple solutions to common problems afflicting conservators of all specializations are offered. These include creating a "contact sheet" for quick reference to an overwhelming number of digital photographs, maximizing comparative content on visuals documenting change, and adding a few atypical but helpful sections to a written report. Finally, the paper explores the qualitative difference between formal documentation--usually in the form of reports written upon completion of treatment and finessed diagrams--and informal documentation such as hand-written notes, lab notebooks, and sketches. The conclusion is that informal modes and methods are vital to an accurate portrayal of the complexity and subjectivity of our conservation treatments.

### **Visualizing the Hartog Plate: An innovative approach**

*Tamar Davidowitz, Dr. Robert Erdmann*

This paper will describe a method of integrating multiple imaging techniques into a single, interactive, digital document, utilizing recent developments in data science and interactive visualization. This has led to a precise, flexible, and user-friendly documentation methodology, resulting in the integration of documentation into the conservation process itself. Allowing the conservator to annotate these digital documents during treatment provides an opportunity for optimal insight and transparency.

This method was initially developed for the conservation of the Hartog Plate, the first known object of European origin on the continent of Australia. Not only is the Plate a fascinating object in terms of material complexity, it is a document of singular importance to Australia and exploration history. To commemorate the 400th anniversary of its placement, an extensive documentation and conservation project has been carried out. In conjunction with the material stability of the object, a primary aim of the project has been to develop a methodology with which to give insight to conservators, researchers, and the general public regarding the Plate's material history, its current condition, and contemporary conservation practice.

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The fragmented surface is severely corroded, and the layers of tin oxide—which contain the famous inscription—are delaminating. The greatest conservation challenge was the removal of past restorations, which were distracting from the object's readability and potentially harming the material itself. While the stabilization of the object and the removal of all unoriginal material were the main conservation goals, the documentation and presentation of its material history, condition, and conservation were imperative considering its importance as a historical document. Various complementary visualization techniques, such as x-radiography, UV-light photography, microscopy, and comprehensive 3D structured light and CT scans were implemented to gain a better understanding of aspects such as geometry, adhesion, material degradation processes, and crack propagation in the bulk.

Given the numerous imaging data sources used in the investigation, a single self-consistent model of the Plate needed to be assembled with minimal imaging artifacts. Registering the data in this way ensures that any point in the Plate can be queried, containing all of the signals from all of the imaging modalities. With this data, statistical analyses and multimodal visualizations can help to reveal interesting or anomalous areas of the Plate for further study and documentation. All of the fused datasets for the Plate are stored in a multi-resolution format that allows for fast data retrieval. This enables real-time interactive visualization through a web-based visualization engine, providing direct access to the data via tablets and laptop computers for material analysis, treatment, and the presentation of findings. In addition, all details of the current on-screen view are encoded in the URL, enabling easy bookmarking, sharing of complex annotations, and linking relevant documents. The technologies and tools applied to the documentation and conservation of the Hartog Plate serves as an excellent example of what is already possible and the direction further developments can take.

### *Treatment: Don't go it alone*

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#### **Unraveling the Past to Inform the Present: Conservation of Egyptian mummies at the Penn Museum**

*Molly C. Gleeson, Alexis North*

Central to the collections of the University of Pennsylvania Museum of Archaeology and Anthropology (Penn Museum) is the Egyptian collection, which is one of the largest collections of Egyptian and Nubian material in the United States. Housing approximately 50,000 individual objects, the collection was assembled over nearly a century, beginning with purchases and gifts but mostly through excavations led or sponsored by the Museum. Included in the Egyptian collection are the mummified human remains of multiple individuals, spanning the whole of ancient Egyptian history. These mummies, while representing just a fraction of the Penn Museum's extensive collection, continue to be one of the biggest visitor attractions and many have been on display for decades. Over the last four years, there has been a concerted effort to address conservation needs

for the Egyptian mummies in the collection, thanks to the Penn Museum's public conservation lab, "In the Artifact Lab: Conserving Egyptian Mummies."

Opened in 2012, the lab was set up in a gallery, which provided the necessary space to conserve the mummies and was also an exhibition in its own right. This configuration has allowed the mummies to remain on view while undergoing conservation treatment, and the work includes daily public outreach which has heightened awareness of the museum's collection and the field of conservation. Before this project, the most recent conservation and in-depth examination of mummies was carried out in 1980 in preparation for the exhibition: "The Egyptian Mummy: Secrets and Science." While treatment records and photography exist from this time period for most of the mummies in the gallery, they are brief and often lack details about decision-making processes or materials testing. Prior to this exhibition, it is evident that the mummies were worked on but there are minimal records of these interventions, including the autopsy of four mummies in the early 1970s. In many cases, the same repairs have been observed on multiple mummies and on objects in the Egyptian collection, which may be associated with preparation for their display in the museum in the 1930s. This implies that there was a consistent treatment approach, even though few treatment records exist.

In an effort to establish best practices and suitable treatment protocols for the mummies, Penn Museum conservators, along with curators and collections staff, have spent the last several years reconstructing the histories of these mummies through careful examination, scientific analysis, and research into their excavation records, collection circumstances, exhibition, and past treatment. Lacking formal guidelines for the treatment of mummies, the conservators developed a standard approach to treating mummies in the collection, informed by the way these mummies have been displayed and treated in the past, and building on methods developed by colleagues in the field. This, combined with the public outreach efforts, is changing the way both colleagues and the public perceive and interact with the mummies and the larger collection.

#### **A Pole with a Story: Innovative conservation and documentation of an American Indian story pole**

*Lesley A. Day, J. Claire Dean, Ellen J. Pearlstein*

This paper will describe a structural, yet reversible, treatment of a 5.75 foot tall painted wood story pole carved c. 1930 by Chief William Shelton of the Tulalip tribe. The treatment and innovative documentation were carried out at the Hibulb Cultural Center in the summer of 2014. Totem or story poles that have spent decades outdoors are invariably structurally compromised due to rot, insects, and other biological growth. In order to restore structural stability, past treatments of wooden totem/story poles have involved serious interventions that were neither reversible nor re-treatable, including impregnating the rotted wood with epoxy resins.

While this treatment has been beneficial and allowed many deteriorated poles to be preserved and displayed (indoors and

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outdoors), treatment goals were sought that would impart stability to the object in a highly reversible and re-treatable manner, particularly because this story pole would remain indoors. Consolidation of the rotten and insect-eaten wood was conducted with Butvar®B-98 (polyvinyl butyral resin) and a removable, flexible epoxy resin fill system (Conserve Epoxy W200, a conservation grade epoxy resin) was devised to fill deep, irregularly shaped voids within the pole section. During the treatment, an exciting discovery was made in the identification of this pole section as belonging to the “Comeford Park Pole,” long thought to have been lost. In addition, by researching historic photographs of the Comeford Park Pole in the HCC archives and consulting with Tulalip tribal members, the top section of the pole was revealed to be another unidentified pole section located in storage and confirmed through photodocumentation techniques.

These discoveries generated excitement within the community, and in consultation with native Tulalip carver and artist James Madison, plans were developed to reunite the pole sections with a strong back to be carved by Madison. Sharing the conservation treatment with the Tulalip community was important to the conservators in order to generate interest in and display transparency about the conservation treatment. To this end, the treatment was documented using a time-lapse camera and edited videos were shared on the Hibulb Cultural Center Facebook page.

### **Treatment of a White Louise Nevelson Installation**

*Sarah Nunberg, Cindie Kehlet, Soraya Alcala, Mathew Eckelman, Carolyn Tomkiewicz, Chris McGlinchy, Carolyn Tomkiewicz, Michael Henry, Jens Dittmer*

The Louise Nevelson Chapel of the Good Shepherd installation at the Saint Peter’s Church in New York City consists of seven sculptural elements. An all-covering thick, white, chalky restoration paint, applied from 1986-2006, has disfigured the sculpture surface. This paper will discuss paint analysis, the interaction between the original paint and the restoration paint, the condition of each paint layer and the final treatment plan as well as the art historical background supporting the treatment, the sustainable approach to the treatment and the church community involvement. The ethics behind the treatment, justifying removal of the restoration layers will also be discussed.

Through examination of the Saint Peter’s Nevelson surface and cross sections, as well as eight additional white Nevelson sculptures, it was determined that the original paint surface was a homogeneous cream white coating. Deterioration of the restoration layers had created a problematic surface that was actively flaking, deteriorating and discolored. Additionally, the restoration paint is dirty, uneven with bumps, ridges, brush hairs, and is lifting, peeling, and pulling up original paint. Devising a treatment method to stabilize and clean the surface has been a multiphase process dependent on the art historical research, paint analysis, and church funding.

Scientific analyses of the sculptures involving Nuclear Magnetic Resonance (NMR), Gas Chromatography (GCMS),

X-Ray fluorescence (XRF), and Fourier Transform Infrared Spectroscopy (FTIR) indicated that the original paint is an alkyd resin with titanium dioxide pigment. The restoration layer was identified as polyvinyl acetate paint (PVA) with titanium dioxide pigment as the colorant. Analysis of a brown streaking residue and white bloom indicate that pentaerythritol (PE) (degradation products of the alkyd) have leached into the PVA and deposited on the restoration surface, somewhat merging the two paints. The analysis was central to designing the treatment, allowing identification of a cleaning system that would solubilize the restoration paint layer without disturbing the original paint. Environmental management was key to stabilizing the sculptures. The environmental conditions of the chapel were studied to allow for a comprehensive plan that will be implemented through renovation of the HVAC system and a new lighting system.

This paper will discuss treatment goals including the decision to use funori to consolidate the paint and PVA Nanorestore gels to separate the restoration paint and reveal the original. The success and method for applying the funori will be examined and the gel application approach described. Waste reduction, minimizing toxicity and minimizing the environmental impact of the treatment were a goal of the treatment plan. A life cycle analysis (LCA) of the cleaning options influenced the treatment choices and methods. The progression of the project through funding applications, and the conservator involvement in discussions with the church community lead to the resulting execution of the project in phases and was a major part of the project success. Educating the church community, and working with the church pastors and congregation was a key part of the treatment process and a learning experience for all.

### **Not a Known Carcinogen: Health and safety considerations of new and innovative treatments**

*Anne Kingery-Schwartz, Kerith Koss Schragger, Julie Sobelman*

Innovative conservation treatment often means using new materials, adapting old materials in unusual ways or adopting novel techniques and technologies from other fields. Presentations on these innovations, whether through conferences or journals, tend to focus on the mechanism of the techniques, their uses and how they improve the treatment and affect the objects. Occasionally they touch upon health and safety issues, yet still emphasize the health and safety of the object over that of the conservator. In the adaptation of any innovative technique, the health and safety associated with the materials should be considered. But what if that information is limited or unclear? This paper will explore the health and safety issues of innovative treatments; how conservators should interpret health and safety data in general; and what steps to take if there is no information available.

Cyclododecane will be used as a case study to highlight the unique health and safety scenarios faced by conservators of all specialties and where health and safety in general falls into the treatment decision making process. Although used in conservation for over twenty years, cyclododecane as a treatment option is still considered innovative as conservators continue to find

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new ways to take advantage of the fact that it slowly sublimates at room temperature. It is a material that is used across conservation disciplines, so most conservators have or will encounter cyclododecane over the course of their careers. Cyclododecane also represents a material that, as it is more commonly used without addressing safety concerns, becomes accepted as safe without question. In fact, there is very little health and safety information for cyclododecane (or many of the other chemicals used in treatment, particularly in the off-label use by conservators). The information that is provided may be misleading or confusing to those unfamiliar with industrial hygiene terminology. One manufacturer states the “general population will not come in contact with cyclododecane as the substance is manufactured and used exclusively in industrial settings under strictly controlled conditions.” A review of the conservation literature indicates otherwise; cyclododecane is being used outside of industrial settings, conditions are not strictly controlled and there is significant potential for exposure to conservators and the general public. The authors will also discuss the recent decision by conservation suppliers to discontinue carrying cyclododecane and the implications on conservators and their treatments.

Conservators dutifully checking Safety Data Sheets become frustrated by the phrase “no data” in critical fields. How should conservators interpret minimal SDS information and, more importantly, how should they protect themselves? The paper presents the available resources for finding out about the health and safety issues related to all materials, since even materials that have a history of use within conservation have not been thoroughly studied. The authors will discuss the choices that conservators make when dealing with unknown health risks based on interviews with conservators who have used cyclododecane and what these observations reveal about considerations of health and safety within the field of conservation. And finally, they will outline their journey to get the American Conference of Governmental Industrial Hygienists (ACGIH), the body that recommends airborne concentrations of agents and exposure conditions, to define health and safety data for cyclododecane.

### **Re-exhibiting Akeley Mounts at the Field Museum, Chicago**

*Lisa Goldberg, Thomas Gnoske, Ronald Harvey, Shelley Reisman Paine*

The Field Museum of Natural History recently opened a new diorama featuring four mammal specimens that had been previously exhibited in an oddly placed case situated among the reptile displays. After much consideration and visitor surveys, the Museum moved forward to create its first new habitat diorama in over 60 years, reinstalling an existing 1921 grouping of Striped Hyenas created by Carl Akeley into an original empty diorama cell. The project was funded by a successful Indiegogo campaign that raised funds from across the globe. Creating this new diorama involved the full scope of the museum’s exhibition process as discussions and planning proceeded to design the habitat, add new specimens and create a space that would ensure their preservation. The Striped

Hyenas are significant in terms of the history of taxidermy. They were collected, prepared and arranged for display by Carl Akeley, one of the most renowned American taxidermists. The decision to create the new habitat diorama allowed access to the hyenas for careful consideration of Akeley’s (often secret) methods, materials and techniques for mounting and display of specimens. A small team of conservators and scientists collaborated to ensure that the hyenas were carefully treated and studied prior to installation.

The treatment included many thoughtful choices. Primary were those related to the visual integrity of the specimens that resulted in the inpainting only the sides of the mounts seen by visitors. Further, the overall color balance for lighting the diorama was chosen to reduce the appearance of fading. Analysis, examination, cleaning and stabilization of the specimens revealed details about Akeley’s methods that were previously unknown and presented new information about his taxidermy techniques. Visually disfiguring overpaint and damage previously attributed to pest activity was reconsidered in light of research revealing that deterioration during field preparation of freshly harvested mammalian skins can lead to hair slippage and overpainting during the mounting process. In spite of the tight time schedule for treatment and display construction, the group was able to collect information about Carl Akeley’s techniques that helped guide treatment choices and inform display conditions.

### **Flouting Convention: The integration of Asian paintings at Taliesin and their conservation**

*T.K. McClintock, Lorraine J. Bigrigg, Deborah LaCamera, Lisa Berk*

The year 2017 marks the sesquicentennial of the birth of Frank Lloyd Wright (1867-1959). Chicago is where he gained his renown as an architect and where he was first exposed to the arts and architecture of Japan at the World’s Columbian Exposition in 1893. Chicago is also the city from which he was socially ostracized in 1910 upon his return from a year in Europe preparing the Wasmuth portfolio (accompanied by the wife of a client while his family remained in suburban Oak Park).

He retreated to family land near Spring Green, Wisconsin where he built Taliesin, a manor house, studio, design laboratory, and working farm. The house was destroyed by arson in 1914 and damaged again by an electrical fire in 1925. While tragic in the loss of both lives and property, it did allow for Wright to rebuild a third time with a still more expansive and refined vision to encompass a main house and studio, theater, farm buildings, and, after 1932, accommodations and facilities for a fellowship and school.

This permutation, Taliesin III, was the most personal embodiment of his Prairie House style and a work in progress for the rest of his life. Integral to the architectural esthetic was the display of Asian art, for which Wright was an early, voracious, and discriminating collector. This was most clearly expressed in the form of large format Japanese and Chinese paintings mounted flat against the wall to fit specifically prepared for locations. These displays were complemented by works of sculpture, the decorative arts,

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and the always present Japanese woodblock print.

This presentation will focus on the treatment of a group of markedly compromised Japanese screen paintings and Chinese scroll paintings reformatted as panels that were mounted in the important public rooms at Taliesin. It will be framed by a brief discussion of the preliminary condition survey of the larger group of paintings and the curatorial assessment of their quality; improvements to the building envelope and mitigating the extremes of the internal environment; the period of interpretation as the final year of Wright's life (as significant changes to the complex were made after his death, and in addition to accommodating tours, the complex continues to be used by the legacy fellowship as a residential and working facility). It will consider the decision making process both to display original works year 'round (in lieu of removing the paintings seasonally or using full size photo-reproductions) and to develop an esthetic of conservation for the other original furnishings.

Most of the presentation will focus on the conservation objectives, procedures, materials, techniques, and sensibilities inherent to the treatment of large format works of Asian art on paper and silk, as well as the variations from traditional practices that have proved valuable for works collected for and displayed in the Western context. Finally, it will examine the place of specialization within the profession of conservation, the rationales that substantiate it, and what value it has in the cross-pollination of technical developments.

### *Unique Objects, Unique Treatments*

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#### **The 40-year Conservation Story of Bruce Conner's CHILD**

*Megan Randall, Roger Griffith*

Bruce Conner's CHILD was created in 1959 as a response to the sentencing of death-row inmate Caryl Chessman who had been incarcerated for the kidnapping and sexual molestation of a woman in Los Angeles. Conner responded to this high-profile capital punishment case and his visceral repulsion to it by creating a frightening sculpture of a deformed corpse-like child. Made from casting wax, the figure appears strapped to a wooden highchair with belt and twine, the head tilted backwards with a gaping or screaming mouth, and body veiled in torn and stretched nylon stockings. The disturbing and emotionally charged imagery of CHILD served as a lightning rod upon its initial exhibition at the De Young Museum in 1959-1960. CHILD was acquired by MoMA in 1970, and while the sculpture was lent to three venues since its acquisition it has never been on view at MoMA nor included in a Conner retrospective until 2016.

This paper will overview three main aspects of the project: the history of CHILD and its condition at MoMA, the treatment process, and the documentation and analysis implemented to record the treatment and monitor its current and future condition. In 2015 MoMA hosted a group of scholars and conservators to

review CHILD's history and come to a consensus on if and to what extent a conservation effort was possible or appropriate. Since its creation in 1960 the wax figure had taken on an increasingly slumped position due to a gradual delamination along the original tacked joins. The nylons had pulled away from the sculpture during an earlier restoration attempt in 2000 and hung tenuously from the chair in small bundles. CHILD's condition in 2015 was ultimately deemed unexhibitible and a treatment attempt was decided upon.

The goal of the treatment of CHILD was to return the figure and the nylon stockings as close as possible to their 1960 orientation and, once in place, stabilize the sculpture so that it could withstand exhibition and travel in the present and future. We will review our treatment processes: removing sections of CHILD from its original chair, the production of a mock chair, stabilization and armature building of the wax components, and replacement of small sections of missing nylons. The overall treatment design was formulated in real time in response to the condition of the wax and trial and error of various armature designs. Rebuilding the wax figure was iterative and required the use of an armature material that could be reworked. We used a thermoplastic polyester resin, polycaprolactone, embedded in a variety of mesh and scrim materials to construct the armature. And finally, this paper will review the documentation procedures we implemented to visualize the treatment including a GoPro timelapse, x-radiography, and photogrammetry. Material analyses of the treatment materials and wax were also performed by the MoMA science conservation department. These sets of information will also be used to monitor CHILD's condition and stability as it moves to other venues in the exhibition.

#### **How Important is Knowing the Ropes? Thoughts on the ethics and practice of conserving ship model rigging**

*Davina Kuh Jakobi*

The Rijksmuseum Amsterdam holds a significant collection of ship models transferred from the Dutch Navy in the 1880s. One particularly miniature model, the Thetis, is a 1:150 scale (estimated) fully-rigged model of a 24 gun, three deck ship. The model is polychrome and has decorative elements such as a crowned lion figurehead and stern carvings both carved from wood, and painted lead fishtail drops on the lower portions of the quarter galleries. Additional fittings include two anchors, two launches hanging above the waist, a ship's bell, and a capstan on the main deck under bone grating. Though it is thought that the model represents a frigate named Thetis built in Amsterdam in the 18th century, it is unclear exactly which vessel the model represents, nor is it understood who made the model or for what purpose it was built, meaning that it is considered a non-technical model. Although the Thetis has been subject to at least three previous restoration campaigns, the thread rigging and textile sails of the ship model were found to be in an overall poor state and unstable condition.

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While rigging is often considered an important aesthetic component representative of a vital functional element on ship models, it may not always be accurate to the ship or the period that is represented for a variety of reasons. These materials are often the first part of the ship model that experience damage. On the *Thetis*, most of the silk sails were damaged, with tears and losses throughout. Additionally, much of the cotton thread that represents the running rigging was desiccated and broken. There is little to no formal literature regarding materials commonly utilized in ship model rigging, the conservation issues associated with ship model rigging, or the potential conservation treatments for this aesthetically complex portion of ship models. Traditionally, ship model makers, historians, and hobbyists have restored ship models, often completely removing and re-rigging the model as part of the restoration process. As part of this, damaged, desiccated, or what is considered incorrect rigging is often removed and replaced. The *Thetis* is no exception: it is likely that the rigging and sails were replaced sometime after it was accessioned into the Rijksmuseum in 1883. However, an additional crucial issue that required further consideration prior to conservation process is that the model has been incorrectly rigged in many areas.

The historic practice of re-rigging still remains common in the field of ship model restoration on an international scale within both private and institutional collections. However, the ethics of performing full and even partial re-rigging on these unique objects must be carefully considered, especially in regards to miniature scale and non-technical ship models. This paper will use the most recent conservation treatment of the rigged portion of the *Thetis* as the lens to explore the ethical considerations in the conservation of ship model rigging, with the goal of providing a suggested practical methodology.

### **Reattaching Without Adhesive? Yes, We Can! The reactivation of paint on animation cels**

*Katharina Hoeyng, Art Kaplan, Joy Mazurek, Carolyn Carta, Vincent Beltran, Kristen McCormick, Michael Schilling*

Research is underway at the Getty Conservation Institute (GCI) and the Walt Disney Animation Research Library (ARL) to investigate storage and treatment strategies for animation cels. Animation cels are transparent sheets of cellulose nitrate, cellulose diacetate, -triacetate or polyester that are inked on the front – which is the viewing side – and painted on the reverse. A condition survey of animation cels, selected from productions between 1937 and 1989 from the ARL collection, revealed that only a small percentage of cels show evidence of paint cracking, delamination or flaking.

This paper will present recent innovations in paint reattachment, based on research findings, which rely on intrinsic hygroscopic properties of the cel paints. As described in lab notebooks, paint recipes and other documents in the Disney Archives, paints made at the Disney Ink & Paint Department between 1936 and 1986 were formulated with gum-based binding media. Surfactants and humectants were added to the paints to improve application to the plastic sheets and impart flexibility to the dried paints.

Verification of the archival information was carried out using gas chromatography/mass spectrometry (GC/MS) on a selection of cel paints, which also provided useful estimates of pigment-to-binder ratios and precise information about additive compositions. Time-lapse video of an experiment, placing a cel in an environmental chamber and fluctuating between 15 and 75 percent relative humidity (%RH), revealed the responsive behavior of the sheet and paint. Surprisingly, previous delaminated paint reattached in some areas at elevated RH levels.

To investigate the causes of these phenomena and assess the relative hardness of paints as a function of RH, selective paints were studied using manually applied indentation on a micro-scale ranging from 30-85%RH. Interestingly, some colors became almost fluid above certain %RH levels, but regained their firmness as the RH was reduced. Analysis of these paints by a nano-indenter instrument is planned for comparing to the results of manual indentation. Time-lapse studies of cels undergoing temperature cycling will also be conducted for comparison. Based on these findings, the conservation approach aims to investigate the reactivation of hygroscopic additives in the paint media, thus minimizing the creation of a moisture barrier. A number of application techniques are explored that utilize humidity, solvents and combinations of both, with limits imposed by the solubility parameters of the paints and plastic sheets. Use of a specially constructed workstation based upon approaches for reverse-glass paintings conservation, where the object is elevated onto a glass plate and a mirror is placed underneath, permits simultaneously viewing and imaging the front and reverse of cels during tests and treatments. The use of humidity and solvents to treat flaking paint by reactivation is a balancing act that poses interesting practical and ethical issues. Can treatments cause permanent distortions in the plastic sheets? When can migration of additives in the paints and sheets occur? To what extent can paint be re-solubilized without changing its original characteristics? Responses to these issues will be discussed.

### **It's About Time**

*Beth Richwine, Diana Galante, Dawn Wallace*

From May 2016 through September 2016, a team of conservators worked to get the Great American Historical Clock assembled and operational in preparation for filming and later inclusion in an exhibit called “Democracy,” opening in July 2017 at the National Museum of American History in Washington, DC. The clock, built about 1893, represents one man’s vision of important historical events in the history of the United States. When assembled, the clock will measure a little over 11-1/2 feet tall, 6 feet wide and 4 feet deep. The assembled clock includes an actual clock, dioramas of historical events, painted panels, an orrery, and a procession of soldiers and presidents.

Most of the dioramas have animated elements, such as Pocahontas pleading for the life of John Smith, that are tripped to move by the times on the clock. Moving parts are run by a mechanism that includes three heavy weights running down through the central core of the clock and connected by gearing

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to a central shaft with chain drives running out to each diorama. It also includes a music box which is tripped in concert with the movements of the dioramas. The clock was meant to travel and so comes apart as a series of cubes for packing. There is evidence that it traveled with a variety show as far as Australia and Hawaii. Then it traveled back through the US by way of Seattle to Boston where its maker, C.S. Chase, lived. In later years, it was on view in two different barns in New Hampshire before being acquired by a dealer and subsequently by the Smithsonian in 1979.

A team of 9 conservators treated the clock over a five-month period and included 4 contract objects conservators, one contract textile conservator, one contract clock restorer and three staff objects conservators. While the clock has been conserved to clean and stabilize the materials and components, minimal loss compensation was done, as the age of the clock, its life, and history were taken into account. After the clock was conserved, it was operated for a short time so it could be filmed. The film is to be included in the exhibit to show how it operates. The clock cannot be run routinely because of the fragility of some the materials and the constant maintenance required. Since the clock will not be run during the exhibition, the documentation of the project and mechanisms is of incredible importance. This project allowed for analysis and exploration into this fascinating piece of American Folk Art and provided clues to the mystery of the maker, his timeline and processes he used in building the clock. The logistics of organizing the project and coordination between the many conservators and labs, both staff and contractors, with different specialties proved to be a unique and challenging opportunity. With considerable coordination and planning, the project was completely successful.

### **Nanocellulose Films: Properties, development and new applications for translucent and transparent artworks and documents**

*Remy Dreyfuss-Deseigne, Anne-Laurence Dupont*

Graphic artworks and documents, made of translucent or transparent supports, are omnipresent in archives and museum collections. Thin papers, tracing papers, cellulose acetate sheets or films are a few examples. But these supports are in general delicate and fragile, and the artworks and documents made on these materials can very often have some structural alterations, which can be a major problem for handling, consultation, digitization or exhibition. The field of nanotechnologies offers new possibilities to solve these specific problems.

The main objective of the present study is to introduce new and innovative mending materials, in particular, nanocellulose films. The study focuses on one kind of nanocellulose, the microfibrillated cellulose (generally abbreviated MFC). This material has the best properties of cellulose, combined with some promising characteristics of nanomaterials. For instance, a MFC film is made of pure cellulose and so is very stable. It can be as transparent as a polyester film like mylar. Also, a film that is composed of microfibrils with a width of a few nanometers, can be very thin

(with a thickness of a few  $\mu\text{m}$ ) and at the same time have a high mechanical strength.

In the first part, this material, these unique properties and the chemical processes to produce MFC will be defined. The second part will present the main results of research carried out at the National Library of France (BnF, Paris, France) on MFC films, such as the comparison with four thin Japanese papers generally used to mend tears on translucent artworks, its combination with different adhesives, and artificial aging tests (light, temperature and humidity) as well as mechanical strength tests. MFC films were used for the first time on museum objects, to mend large tears of some optical viewing slides made of thin and translucent papers, which belong to the French Museum of Cinema (la Cinémathèque française, Paris, France).

Compared to traditional repair methods, the MFC film results were best suited for the treatment. The repair method developed will be presented. The third part will report the first results from new research to be carried out at the Research Center for Conservation (CRC, Paris, France) starting in the fall 2016. This project will entail a partnership with American and French nanocellulose manufacturing laboratories and the French Museum of Cinema. Different types of nanocellulose films will be made. Further mechanical and chemical tests will be conducted on unaged and artificially aged films, in order to better characterize the films, such as pH and mechanical strength measurements, molar mass determinations, SEM measurements and fungal resistance tests. The films will be applied on a wide range of cinema and animation film media from the Museum collections, made of translucent and transparent supports. This research will be an opportunity to gather new information about the nanomaterial itself and its new potential applications in the field of conservation. The various aspects of the commercialization of MFC films for museums and conservators will be presented as well.

### **Development of Cleaning Treatments for Asian Lacquer**

*Marianne Webb, Herant Khanjian, Michael R. Schilling*

Over the last four decades, the knowledge about Asian lacquer formulations has grown exponentially, particularly through application of pyrolysis-gas chromatography/mass spectrometry with thermally-assisted pyrolysis and methylation (THM-PyGCMS). Analytical research has revealed that Asian lacquers are complex mixtures of materials, each of which influence the behavior and deterioration processes. This perspective explains why safe and effective cleaning methods for lacquer have yet to be established.

In this paper, we will describe current practice, the present state of knowledge, ethical considerations and research goals towards developing safe and effective methods of cleaning Asian lacquer. Current practice is limited to a few marginally successful methods, most of which involve aqueous cleaning. The skill of the conservator in limiting contact time of the solution dictates success, regardless of whether the solution used is low pH or simply distilled water. Asian lacquer is susceptible to blanching, sudden discoloration or erosion with the slightest misjudgment.

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Research on cleaning must take into account a range of lacquer formulations, which have been shown to vary by country, region and time period.

By adopting the analytical protocols taught in the Getty Conservation Institute “Recent Advances in Characterizing Asian Lacquer” (RADICAL) workshop, researchers around the world are establishing patterns of materials and methods, which can be used to make mockups that reflect the main components of Asian lacquer. Methods of accelerated aging, developed in research at the Victoria and Albert Museum, have produced weathered surfaces that closely approximate the appearance of naturally-aged lacquer. Better understanding of the chemistry of Asian lacquer surfaces has come from detailed analysis of aged lacquer mockups. In developing new methods, ethical issues of cleaning must be considered. What are the goals for the treatment? Removal of dirt alone seldom makes Asian lacquer look better, whereas removal of the degraded lacquer surface layer often improves the appearance by revealing a fresh, glossy subsurface layer. Should the approach to lacquer be similar to the removal of tarnish from silver, or should methods be developed that separate dirt from the degraded surface layers? Should coatings be applied to improve the appearance, or might there be a middle ground? Observation of surface interactions of the mockups with solvents, solutions and dirt surfaces will be an important aspect towards the development of effective cleaning methods for a wide range of lacquer formulations.

## **Learning Together from Preventive Conservation: Restoration of the choir room of the Convent of Mercedarian Sisters (S XVIII), Lima, Perú**

*Erika Anticona*

The Convent of the Mercedarian Sisters was built in 1727 within the Historic Centre of Lima. It is one of the convents that form part of the Provincial Archbishop of Lima, where the Cathedral of Lima conducts restoration projects through its technical team. In our experience on convents, the conservation works require a strategy to convince the occupants that their real and personal properties are Cultural Heritage of the Nation. We should articulate the conservation and restoration needs, with their daily life, and explain what they call “conservation measures.”

Since our first encounters with religious orders, we have been able to establish a work methodology based on dialogue and interaction, aimed at the conservation of cultural goods. In the case of the Convent of Madres Mercedarias, the Choir of the Convent, a 300-year-old architectonic structure, never intervened before, showed a high level of deterioration, which caused a complex intervention at structural and architectural level, besides the restoration of the Assumption Altarpiece placed in the choir room, which was about to fall too. Although the decision to execute the restoration of the choir room was taken, there were other items we found which needed immediate intervention, such as the paintings with high historic and artistic value (many of them from 17th and 18th centuries) which needed an adequate conservation preventive management. One of the basic considerations for the execution of conservation works with Mercedarian nuns have been the permanent communication and participation, since they have carried out for decades superficial maintenance works, which sometimes were detrimental for the conservation of the items: “shaking,” “washing,” “polish,” “rub”; besides, the construction of buildings with modern materials in several sectors of the convent were detrimental to conservation too. In the daily activities of nuns, we could identify a series of useful preventive conservation activities, and others that had to be changed, as well as the important location of damages: they were able to identify the problems and deterioration levels of the goods and cloister’s structures. Once the restoration processes finished, the old maintenance techniques were compared with the interventions for architectonic and collection conservation.

## **The Perfect Room: The restoration of the Old Senate Chamber at the Maryland State House, Annapolis, Maryland**

*David C. Overholt*

The Old Senate Chamber of the Maryland State House was the location of nationally significant events in 1783 and 1784. As the temporary home of the Continental Congress, it was here that General George Washington resigned his commission to Congress, thus creating the first modern democracy. It was also in this room where the Treaty of Paris was ratified, officially ending

the Revolutionary War.

The historic space recently underwent a multi-year, state-of-the-art restoration to return the room as accurately as possible to its 18th-century appearance. Exhaustive physical investigation and meticulous research ensured the authenticity of the richly-ornamented architectural detailing and the furnishings as they would have appeared on December 23, 1783. This paper documents the decision-making processes required to adapt the use of historical materials and methods of construction, to matters of budget, schedule, existing conditions and performance.

“The Perfect Room” explores the real consequences and the effects of modern systems and technology on a single room preserved through pristine approaches of traditional processes using authentic 18th century materials. Traditional craftsmen, experienced in 18th-century building practices, undertook various aspects of the restoration, including the creation of flat and decorative plasterwork, millwork, flooring, blacksmithing, and painting, using period techniques. Hand-mixed paints, reclaimed flooring of the highest quality, lime plaster, and hand-planed lumber were used on all visible surfaces.

From the beginning, the project team aimed for the highest standard of authenticity in the use of traditional materials and historic construction methods. Yet, the reality of restoring such a room in a modern environment meant creating a balance between using modern materials and techniques in the infrastructure and sub-surface areas and maintaining a visibly 18th-century finished space.

This presentation will provide an analysis of the design details for the following project components:

- Conservation of the central niche.
- Conservation of the original columns, and columns from an early balcony restoration.
- Hand-mixed paints and distemper coatings.
- Installation of edge dowelled floor boards.
- Millwork. Why it was necessary to glue certain components of the millwork to ensure its stability.
- Nails. Mild steel was used in the production of handmade nails; wrought iron was not available in the time frame in which the project had to be completed. Nail production also utilized machine stamping of heads in lieu of hand-forging.
- Furring strips were primed on all sides to ensure stability and long lasting performance. There was no evidence that the original furring strips were coated.
- Decorative Plaster was precast (rather than run-in-place) with some applied detailing for cost and schedule savings.
- Flat Plaster on brick masonry walls, the use of rice paper to preserve traces of original 18th century plaster and wire mesh lath to ensure stability of lime plaster over a cracked brick substrate.
- The reality of using historic materials and techniques within a building with modern mechanical systems, in-use as a functioning government complex.

## **Research, Encapsulation and Replication of the Original 1844 Trompe l'oeil Apse Mural in the Old Whaler's Church, Sag Harbor, NY**

*Geoffrey Steward, Mary Aldrich*

The Old Whaler's Church, designed by Minard Lafever, was built in the Egyptian Revival style in 1844 with an ornate Greek Revival interior. Due to financial constraints, the curved apse was replaced by a flat wall during the construction. A 40' long x 25' high trompe l'oeil mural was painted to provide the illusion of the curved apse. Over 170 years, the original mural was overpainted six times. We were commissioned to research the original, encapsulate what remained, and to faithfully reproduce the original. In 2013, our team spent ten days meticulously removing at least six layers of overpaint to allow full scale mapping of the original layout from the exposures, detailed information on the hand(s) and stylistic approach of the original team of artists and the use of two late 1800's photographs to provide accurate data to allow a faithful replication of the mural. In the summer of 2014, we were contracted to reproduce the original mural. This was achieved in 12 weeks. We will detail the original research, including the paint stratigraphy prepared by our paint analyst, and review the methodology applied and the resulting replication.

## **500 Capp Street: Conservation of interior contemporary finishes and artwork by David Ireland**

*Dena Kefallinos, Johana Moreno*

ARG Conservation Services (ARG/CS) was contracted by the 500 Capp Street Foundation to perform exterior and interior conservation work of a vacant residence constructed circa 1880 at 500 Capp Street, San Francisco, CA, while it underwent seismic retrofitting, elevator access, and building additions to be converted into a mansion-museum and gallery space. What sets this residence apart from the other Victorian residences in the rapidly gentrifying Latino neighborhood of the Mission District, is that it was once inhabited by famous contemporary artist David Ireland during the 1970-80s. Ireland had filled the house with his artwork and had finished all the walls and floors using commercial products of his time that have since then been discontinued.

This presentation will discuss how ARG/CS approached the de-installation, packaging, storage, and re-installation of contemporary artwork, and the conservation treatments performed on Ireland's contemporary interior finishes with a focus on the lustrous ocher-colored varnished walls, which are unique and characteristic to 500 Capp Street. Conservation work of interior finishes was done room-by-room and coordinated with contractors on site doing seismic retrofitting, electrical, and building additions. Each room was sectioned off with protection and contained to prevent the transmission of dust and workers on site from accidentally touching conservation work. Prior to conservation work, all contemporary artwork that could be removed was carefully assessed, recorded, dismantled, and stored. Artwork that

could not be removed was assessed, recorded, and provided protection in-situ. Conservation work consisted of carefully dry cleaning all the walls of general soiling that had built up over the years. Selective wet cleaning was performed on areas with heavier staining and soiling. Areas with holes were re-plastered and in-painted to match the surrounding walls. Cracks were stabilized by injection grouting. Lastly, walls were re-varnished using an oil-based varnish similar to what Ireland may have used. The selected varnish had to be manipulated in application to mimic the high VOC (no longer legal in California) and slow setting time of the oil-based varnish used by Ireland. Varnish was applied quickly using rollers that left behind a mirror-like finish that did not detract from Ireland's brush strokes and marks. Floors were also finished in a high-gloss oil-based varnish as they had been historically.

Once the conservation work of the interior finishes had been completed, stored artwork was re-installed. Re-installation depended on careful documentation of the artwork's conditions, locations, and positioning prior to de-installation. Re-installation was coordinated with the 500 Capp St. Foundation and the San Francisco Museum of Modern Art (SFMOMA). Interior spaces were acclimatized to receive artwork on loan from the SFMOMA.

## **Conservation in Context: Considerations in treatment planning in relation to the safety of conservators and the general public**

*Beata Sasinska*

One of the primary concerns for most conservators is the safety of the treatment on the material receiving treatment. However, one often overlooked consideration in treatment planning is the safety of the treatment for those carrying it out as well as the general public that may be exposed, particularly in the case of in-situ works and built heritage. Treatment dangers come in many different forms, including exposure to hazardous chemicals, extreme temperatures, vapors, particulates, falling hazards, sharp objects, and more. This presentation seeks to explore some of the common hazardous conditions created by conservation treatments, alternatives and their tradeoffs, and methods to offset the risk. A variety of case study sites in the New York City area will be discussed.

## **Beyond Treatment: Monitoring before during and after conservation of the mural *América Tropical* by David Alfaro Siqueiros, 1932**

*Leslie Rainer, Kiernan Graves*

*América Tropical* was painted by renowned artist David Alfaro Siqueiros in 1932 on the second story exterior wall of the historic Italian Hall, located in El Pueblo Historic Monument in downtown Los Angeles, and is the only mural painted by Siqueiros in the U.S. which remains in situ today. Measuring approximately 18 x 80 feet, *América Tropical* depicts a Mexican Indian, crucified on a double cross beneath an American eagle. Two sharpshooters

are taking aim at the eagle from a nearby rooftop.

Given the significance of the mural and its conservation problems, in 1988 the Getty Conservation Institute (GCI) entered into a collaborative partnership with El Pueblo de Los Angeles Historical Monument, a department of the City of Los Angeles, to conserve, protect and interpret the mural, and provide public access to view it. In the years that followed, the GCI measured environmental conditions, analyzed the paint and plaster, performed conservation treatment, and digitally documented condition and treatment; while the City of Los Angeles built a protective shelter, viewing platform, and interpretive center. These combined activities aimed to preserve and present the mural in its historic and artistic context. The project was completed in 2012.

As part of the conservation component, the GCI committed to carry out post-treatment monitoring for ten years. Over the course of the project, a variety of monitoring techniques were used to understand conditions, follow construction activities, and track changes following treatment. This presentation will discuss the monitoring carried out at each phase of the project, and elaborate on the objectives, techniques, and results achieved. The monitoring activities include environmental monitoring; monitoring of condition before treatment; monitoring of construction activities using a time-lapse camera while the protective shelter was being constructed; and post-treatment monitoring based on a comprehensive monitoring plan developed by the project team to ensure the long-term preservation of the mural and the site. The objective of post-treatment monitoring is to detect and address any change to the condition of the mural, the integrated window shutters and door, the shelter, viewing platform, and surrounding environment, then report this information to the General Manager of El Pueblo de Los Angeles Historical Monument, who is responsible for the maintenance and presentation of the site. The different methods of monitoring each had a specific objective, and were relatively low-cost and easily implemented. They provided valuable information needed at each stage of the work to inform planning and decision-making. Going forward, the monitoring procedures put into place will continue to aid the understanding of the efficacy of current maintenance and management procedures, the conservation treatment, and performance of the shelter. While not all mural conservation projects may carry out monitoring to this degree, the methods used can be easily adapted for use on other sites with similar issues.

## **The Majestic Grand Goddess Cibeles in Madrid and its Restoration in Gauzes**

*Julia Betancor, Daniel Munoz, Macarena Sanz*

This is an opportunity to offer a complete vision of one of the latest treatments of restoration and conservation of the iconic and emblematic Cibeles Fountain in Madrid, one of the most beautiful fountains in Europe. The local government of Madrid commissioned this project, carried out by Garanza Rehabilitación S.L. After 8 weeks of treatment, 45 degrees in summer and under the watchful eyes of citizens, this has been one of the projects with greatest impact on the national media. The Cibeles Fountain,

sculpted in 1781, was covered during the Civil War by the local citizens in order to protect it from the incendiary bombs of the enemy air forces, and it has been witness of the most important events in Spain, Royal Weddings, demonstrations and different social activities and, nowadays, it is the place where Real Madrid supporters celebrate their triumphs. Having been responsible of emblematic works such as principal Altarpiece Mayor in the Monastery of San Lorenzo del Escorial, or the façade of the National Library, specific products, which have been “asleep” for more than 2,000 years, have been recovered during the process by Garanza Rehabilitación S.L.

The mission of Garanza Rehabilitación S.L. was to stop the deterioration of the structural materials. This civil monument was built with several sculptural elements coming from different origins and, even though the main material is purple marble (from Montesclaros), it is considered to be a puzzle of mortars and volumes which need to be balanced, fitted and conserved properly. In addition, we would like to expound the challenge that has supposed the aesthetic intervention due to unfavourable external factors and the complexity of the organoleptic characteristics of the intrinsic materials. These factors have been key points of responsible decisions and have been discussed in a sustainable and respectful way. The Cibeles Fountain is located in one of the most contaminated areas in Madrid. We will show you the dirt caused by intense road traffic, lichen and organic remains and the elimination of the embedded crust of pollution, as well as the sealing cracks and the subsequent protection against external factors of deterioration. Furthermore, with a preservative idea in mind, new measures of conservation have been established which affect the visual show offered by the fountain. The technique of the treatment carried out by the experts will be highlighted and explained together with the products used, which have been analyzed in our chemical laboratory. The Cibeles Fountain reappears as “La Diosa Gobernadora” in Madrid, with the aim of reserving her life for the new generations.

## **Evaluation of an Injudicious Patch Repair Campaign on Exposed Reinforced Concrete and How to Move On**

*Ana Paula Arato Gonçalves, Dr. Claudia T. de Andrade Oliveira*

The Vilanova Artigas Building, home to the School of Architecture and Urbanism of the University of São Paulo (FAUUSP), located in the city of São Paulo, Brazil, is an iconic exposed reinforced concrete structure that has influenced generations of Brazilian architects. Built between 1967 and 1969, this building was designed by architects João Batista Vilanova Artigas and Carlos Cascaldi. Similar to many other modern historical properties, where reinforced concrete is exposed to the influence of natural elements, this building has been experiencing problems in conserving the concrete surfaces that characterize its façades.

In this case, the concrete surfaces are imprinted with the texture of the boards from the formwork with reinforcement placed very close to the surface, usually 10mm deep. After almost 50 years of exposure to CO<sub>2</sub> and rain, carbonation has advanced

over the reinforcement initiating corrosion and causing spalls in the concrete.

In 2010, concerned by the degradation of the roofing structure and the exposed reinforced concrete of the façades, the school initiated the process that culminated in the repair campaign of 2012-2015. The scope of this campaign was to replace the waterproofing system of the roof, substitute the deteriorated fiberglass translucent skylights and to repair the reinforced concrete elements of the roof and façades. Despite the high cultural value of these elements, the professionals hired to develop and execute the solutions had little knowledge on the appropriate conservation methodologies for historic materials, albeit they were experts in concrete repair. Consequently, the materials and methods chosen for this intervention did not follow the criteria of compatibility and minimal loss to the original building material.

In an effort to avoid further risks associated with the addition of poorly specified patching material, this paper focuses on the analysis of the original concrete and the repairs executed between 2012 and 2015. In order to do this, the original concrete is being studied to determine its properties and components to subsidize the development of criteria for future patch repairs. The scientific analysis includes petrography, X-Ray diffraction, thermogravimetric analysis, SEM, chemical analysis and mechanical tests. This is being complemented by a critical analysis of the entire process of the last repair campaign.

In addition, current conditions are being mapped through 3D laser scanning and the state of reinforcement corrosion will be evaluated through potential mapping and resistivity. This will indicate whether corrosion is currently localized or widespread. If corrosion is found to be localized, this is an important indicator that the patches are aggravating corrosion due to an electrochemical incompatibility to the original concrete.

This analysis will be used to guide future conservation efforts. The most important conclusion is the need to include conservation goals in every step of the process, from management to implementation. This work is part of the development of a Conservation Management Plan for the Vilanova Artigas Building funded by a Keeping It Modern Grant from the Getty Foundation.

## **Preservation in ‘Cathedral-Time’: Conservation in the North Transept at the Cathedral Church of St. John the Divine**

*Laura Buchner*

The preservation of the North Transept at the Cathedral Church of St. John Divine in New York City requires unique repair criteria as it is the stabilization of a modern ruin within an incomplete structure. A fire in December 2001 caused significant damage to the stone in this area of the Cathedral. The criteria established to repair the masonry varied from those used for typical ruin stabilization to permit future construction of the original Gothic design. The conservation treatments considered the interventions to the North Transept over the past 15 years and the significance of the deteriorated elements in the context of the original design, as well as the consequence of new repairs on potential future construction

over the coming decades or centuries of the Cathedral's life.

The Cathedral Church of Saint John the Divine, located in New York City, was constructed in phases beginning in 1892. Construction of its North Transept began in 1927, as the Nave walls were beginning to rise. Foundation issues slowed its progress though, leaving the walls only 40 feet high when the full length of the Cathedral opened to the public in November of 1941. A week later the bombing of Pearl Harbor occurred, and, as America entered World War II, the construction of the Cathedral was halted, leaving the Transept and other areas of the building incomplete. A wood framed roof with a bitumen coating was eventually installed over the partially completed North Transept, which served as a gift shop until December of 2001, when a fire broke out in its northeast corner.

The fire destroyed the Transept roof, and the heat of the fire coupled with the cold water from the fire hoses and winter air temperatures caused significant masonry damage within the Transept. The resultant smoke damage throughout the entire Cathedral spurred an interior restoration campaign that was completed in 2008. However, apart from removing debris and installing temporary protection at the top of some of the unfinished walls, little work was performed within the Transept itself. The area was closed to the public until 2013, when a temporary exhibit initiated a make-safe campaign to remove the then deteriorated temporary roofing and fire-damaged stone that had been exposed to the elements for over a decade. That same year, plans began for the installation of a new roof to cover the entire Transept, which is scheduled for completion in 2017. The new roofing campaign incorporated the stabilization of the fire damaged stone and cleaning of the façade, which exhibited significant staining from years of water infiltrating the tops of the walls and moving out through the face of the stone.

This paper will discuss the repair criteria and resultant treatments established to address the conditions within the Transept, which considered practical construction limitations as well as the nature of the living Cathedral in an attempt to balance the accepted loss of severely damaged material and minimal interventions to significant fabric.

## **A Comparative Study of Sacrificial Anti-graffiti Coatings for Outdoor Marble**

*Dorothy Cheng, Jason Church, Mary Striegel*

This research comparatively investigates the effectiveness and visual impact of six commercially available sacrificial anti-graffiti coatings for use on outdoor marble heritage. Sacrificial coatings are reversible barrier films that can protect vulnerable surfaces from damage resulting from this type of vandalism. Graffiti materials such as spray paint and the ever-popular Sharpie marker seep easily into porous marble surfaces to create stains (called ghosting) that are difficult to safely remove. Cleaning processes to completely remove ghosting can result in surface losses. An ideal coating preserves the natural color, gloss, texture, and integrity of marble substrates and adequately aids in the complete and safe removal of graffiti.

The coatings evaluated in this study are PSS 20, APP-S, Protec-tosil AQUATRETE'SG, "World's Best" Graffiti Coating, Graffiti Melt, and Graffiti-Pruf. Each were either chosen due to notable performances in other studies, or their recommendation for use on other types of stone/masonry. Red spray paint and black Sharpie marker were applied to the samples and removed according to the coating manufacturer's instructions. To evaluate the coatings' aesthetic impact and effectiveness in facilitating graffiti removal from Royal Danby marble samples, this study uses data gathered from colorimetry, glossimetry, laser profilometry, contact angle goniometry, gas chromatography-mass spectrometry, and visual assessments. Half of the samples were placed in a QUV accelerated weathering chamber for 800 hours before attempted graffiti removal to assess the long-term effectiveness and reversibility of the coatings after artificial aging. Surface pH levels of the coatings before and after artificial aging and film thickness were also measured. This suite of tests aims to aid conservators caring for outdoor marble heritage in graffiti-prone locations in selecting an appropriate and accessible sacrificial coatings for their needs.

## Conservation on a Grand Scale: The development and treatment of the masonry of the West Block of Parliament in Canada

*Joseph Sembrat, Mark Rabinowitz, Kelly Caldwell*

The West Block is one of the three major buildings on Parliament Hill in Ottawa, Canada that house the country's Federal Government. Begun in the 1860's in a Neo-Gothic style, the West Block has been modified and extended with stylistically sympathetic additions including the massive Mackenzie Tower. Conservation Solutions was engaged to specify and oversee the treatment of every one of the hundreds of thousands of stones on the mass masonry exterior during a reconstruction of the building starting in 2012. A team of contractors, architects, engineers, conservators, and masons worked over 4 years to perform the assessment and treatment, which was completed in 2016. Other work in the courtyard and interiors will continue beyond that.

After laser scanning of the building and development of a set of treatments for each condition was prepared by the architect and contractor, Conservators began a stone-by-stone survey of each wall. Early in the work, which was based on extensive previous testing, additional tests were performed to ensure compliance with the specified treatments as well as to modify and improve any that could be. Laser ablation was tested and found to be both more effective and efficient at cleaning the sulfate crusts and soiling on the sandstone blocks and was substituted for the originally planned wet micro-abrasion cleaning. This allowed for improved work flow as it was better suited to the challenges of the northern climate's cold winters, as well as reducing water entry into the building and achieving a stone surface with porosity characteristics closer to those of the original stone. This was adopted and became the largest laser cleaning treatment ever performed on a building as a result of this testing. Other work was integrated with more traditional masonry crafts in re-pointing, dutchman and other repairs, and unit stone replacement. Tracking the recommended work

on each block and documenting it all to ensure contract compliance and for archive purposes required developing sophisticated technologies that could withstand construction site conditions and readily translate into archive AutoCAD drawings and reports. This paper will present the results of the tests, the means that were developed to address the overwhelming scale of the work, and the successful results of the treatment.

## Solid CO<sub>2</sub> Cleaning and Patina Preservation: Case studies in aluminum and bronze

*Elizabeth Beesley, Joseph Sembrat, Mark Rabinowitz*

Cleaning large-scale architectural elements and sculpture with historic patinas or other decorative surfaces is challenging if these finishes are to be retained while working within the constraints of outdoor sites, large artifact size, and tight budgets. Traditional conservation treatments to remove failed coatings, corrosion, and other accretions from these materials include the use of solvents, high pressure powerwashing and microabrasion. These have the disadvantages of hazards to health and the environment, and the potential for surface abrasion; it may not be feasible to scale up minimally abrasive chemical or mechanical techniques to use on large architectural artifacts.

Dry ice blasting, a technology that originated in the industrial sector, is becoming more widespread for cleaning applications. It has been shown to facilitate cleaning without the surface abrasion and we have used it successfully in three situations where it was important to retain the decorative finish of architectural surfaces. These were: the aluminum door surround of the first American Airways hangar; aluminum surfaces of Cincinnati's Union Terminal; and the bronze fountain at the National Gallery of Art in Washington, DC.

The Andrew Mellon Memorial Fountain was designed by Sidney Waugh and dedicated in 1952. It comprises three nested bronze basins nested with zodiac sign decorations. After washing, tenacious remaining mineral deposits were cleaned using CO<sub>2</sub> blasting, selected because it does not require the containment that microabrasion or laser cleaning do, and was found to be effective at minimizing overcleaning. A combination of adjustments in pressures, feed rates, and nozzle sizes was tested during the work to remove the mineral deposits without removing the underlying patina in most cases. Some areas of thick deposits, or those that were tenaciously adhered, required higher pressure and more blasting time, which did result in removal of some patina.

American Airways constructed their first hangar at Meacham Field, Fort Worth, in 1933. The Art Deco main entrance is flanked by fluted aluminum columns with an aluminum spandrel panel decorated with the AA logo. Previously, an awning above the doors had been removed, leaving soiling and sealant remnants; previous removal had resulted in gouges in the aluminum. We used dry ice blasting to gently clean away old sealant and soiling. Working on an active airfield, it was important to use a method that did not require containment and that retained the historic dark grey patina. Dry ice blasting was especially effective at removing the silicone sealant without damaging the surrounding patina.

Union Terminal was also built in the Art Deco style and uses aluminum extensively for decorative features throughout. Different alloys and treatments were used to produce particular colors or textures. Deplating was an early process that produced a stable dark gray finish; it is no longer used, since replaced with anodized finishes. We required a cleaning method that would retain this historic finish. We found that dry ice blasting was a gentle technique for this and did not have the containment issues or risk of driving water into the building that other methods do.

## **Incorporating Conservation Methodology and Treatment Methods into Masonry Craftworker Training**

*Roy Ingrassia*

As specialized repair strategies and treatments are designed for historic masonry structures, there exists an increasing demand for masonry craftworkers skilled in the proper implementation of both traditional and contemporary techniques. Conservation and Craftsmanship have a rich history in successfully executing approaches that address the needs of historic structures. However, skills-based training faces challenges in the 21st century that is unprecedented due to rapid advancements in building technology, proliferation of materials, and economics. This has dramatically affected the ways in which craftworkers are trained (or in many cases not trained), how the work is executed, and the long-term performance of the repairs to buildings of cultural significance. While new conservation approaches are being formulated to meet the parameters of unique situations, very rarely is the rationale behind these repairs explained to the individuals tasked with implementation. In situations where conservation bleeds into the realm of construction on large-scale projects, the need for masonry craftworkers educated in conservation methodologies is imperative.

Within the past 2 years, the International Masonry Training and Educational Foundation (IMTEF) has launched a Historic Masonry Preservation Certificate Program which provides advanced education and specialized skills training opportunities to the journeyman-level masonry craftworker. The program introduces participants to the concepts and theories behind preservation/conservation and couples this with hands-on training exercises. This program relies heavily on the participation of practicing conservation, engineering, and architectural professionals as well as master craftworkers. This presentation will provide an overview of the program requirements, curriculum, and partnerships with craft-based, professional, and organizational partnerships.

## Less is More

*Adam Novak, Daria Keynan*

The current state of paper conservation is often a dichotomy: respect for the history of the object and a desire to be more conservative in treatment decisions often conflicts with the intrusiveness of treatments that are used to achieve an acceptable aesthetic outcome. Our onus of reversibility, while striving for perfection, can cause the conservator to choose inaction over action. What about when action is warranted? How do we quantify a “good” treatment, first for the steward of the artwork, then for ourselves? Years of study have produced a treatment corpus that has steadily evolved, refining techniques to produce careful and successful reduction of damage. Yet, many of these techniques are invasive, perhaps unavoidably. The authors aim to show that invasiveness can be set to a scale. Working toward a theory of “in-and-out”, treatments can be tailored to reduce the conservator’s imprint on a work of art. This paper will compare recently available techniques to those that are traditionally taught and used in paper conservation. For instance, overall discoloration treated with calcified water versus water adjusted to specific pH and conductivity; or, tidelines treated with sodium borohydride versus chelator gels. The hypothesis is that less invasive treatments can be carried out with excellent aesthetic results. Case studies will be evaluated after treatment with ultraviolet light and accelerated aging, as well as empirical observation.

## Reducing Agent Tertbutylamine Borane Complex and Its Use in Stain Reduction on Paper-Based Artifacts

*Crystal Maitland*

Stain reduction is a sometimes necessary, but often ethically-loaded, consideration in the treatment of art on paper. From the standpoint of cellulose stability, reducing agents are considered preferable to their oxidizing counterparts as they have the potential to mitigate discolorations without further degrading the polymer backbone of paper artifacts. While a number of oxidizing agents have been tried with paper substrates, sodium borohydride has long been the primary, if only, reducing agent. Recent work with gellan gum at the Canadian Conservation Institute has brought another reducing agent to the attention of their paper conservators: tertbutylamine borane complex (TBAB). Explored by Italian researchers and conservators since the late 1990’s, borane complexes show great promise as an additional tool for reducing paper discolorations, but as of yet seem little known in North America. Several disadvantages of sodium borohydride (its tendency to evolve bubbles of hydrogen gas, the high working pH) are not present with TBAB, which shares borohydride’s advantage of being soluble in both alcohol and aqueous systems. This paper will present the use of TBAB in the treatment of several watercolours by Canadian artist Lucius O’Brien, as well as on didactic paper artifacts. A discussion of the working properties, as well as the perceived advantages and challenges of using this

reducing agent will ideally familiarize more paper conservators with this relatively new reducing agent, broadening their choice of stain reduction agents.

## Removing Oil from Paper: A collaborative conservation challenge

*Holly Herro, Scott Webster Nolley, Wendy Cowan, Kristi Wright*

The application of oil-based leather dressing, while once considered a best practice in libraries, has had undesirable long-term consequences for bound materials. At the National Institutes of Health (NIH) in the National Library of Medicine (NLM), a large number of leather-bound volumes had multiple applications of a mixture of neatsfoot oil and lanolin dressings liberally applied. The oils not only absorbed into the leather bindings but also migrated onto the pastedowns, end sheets, and text blocks. The oiling process at NLM was documented by call number, year(s), number of applications, and dressing formula. While investigating treatment options, NLM book conservator Holly Herro consulted paintings and objects conservator Scott Nolley for insight on viable options for the removal of oil from artifacts. Paper conservator Wendy Cowan joined the collaborative effort to develop a treatment protocol for NLM’s oil saturated collections. Together, they investigated the issue and devised an effective method for removal of this oil from the NIH bound paper collection. The protocol developed employs washing with alkaline solutions, followed by alternating applications of petroleum ether and acetone administered over a suction point. Oil components are solubilized by the alternating polarities of the solvents and pulled out of the paper by the suction. The presence of the oil in the paper is thereby greatly reduced. The paper is then washed again with spray applications of alkaline water to remove any remaining water soluble discoloration. This talk will explore further details of the treatment protocol, its development and applications, and the benefits of cross-disciplinary collaboration

## Treatment 305: A love story

*Kathy Lechuga*

Treatment 305 was developed at Princeton University Libraries by conservators Brian Baird and Mick Letourneau. A paper detailing this binding structure was published in volume 13 of the Book and Paper Group Annual in 1994, titled “Treatment 305: A Collections Conservation Approach to Rebinding.” Essentially, a tight joint binding with a natural hollow and minimal spine linings was developed that incorporated all of the positive aspects of bindings from this era with none of the negatives. The Treatment 305 structure provides an incredibly flexible and durable binding that opens very flat and places minimal strains on the book during use. At The Indiana Historical Society, a substantial portion of our printed book collection dates from the late 18th through to the mid 19th centuries. While many of these books exhibit typical damage, such as detached boards and split spines, there are a fair

number of them whose bindings are either non-existent or so degraded that the books need to be rebound. We digitize a fair amount of our collection material and patrons frequently use our books for research, so a flexible, durable binding that incorporated aspects, both aesthetic and structural, of late 18th and early 19th century bindings was needed. Treatment 305 seemed like a logical solution to this dilemma, especially if a few adjustments could be made to tailor the structure, adhesives, and covering materials to a more special collections approach to rebinding.

In this presentation, I will detail two treatments I performed using the Treatment 305 structure adapted for special collections materials. The first book treated was a publication of pre-statehood Acts and Laws which no longer retained its original binding. The book was washed, re-sized, re-sewn, and rebound using most of the original Treatment 305 steps detailed in Baird's and Letourneau's article. The second book treated had a strange "binding on top of a binding" structure which included a total of four boards that had completely failed as a result of previous water damage. This treatment involved much discussion with the curator and a decision was made to construct a binding that used most of the book's oldest elements in order to be sympathetic to its original appearance. The book was washed to remove staining and heavily fragmented printed cover papers were lifted from the original boards, lined, and incorporated onto the new boards. The spine piece was made from a kozo fiber paper and linen laminate and toned to match a fragment of the original leather discovered under a turn-in. The Treatment 305 structure was used for rebinding with a few modifications made to accommodate the incorporation of original elements and this book's smaller size. In both cases, the final bindings resulted in extremely flexible and aesthetically satisfying books that can easily withstand frequent use and potential future digitization on a book scanner. Treatment 305 proved to be an adaptable and expedient solution to the treatment challenges presented by our late 18th to mid 19th century printed book collection.

### **Medium Rare: An innovative treatment approach to the space between special and general collections**

*Quinn Ferris*

Faced with a dwindling amount of general collection items in need of repair, in February 2016, the conservation staff at the University of Illinois Library began implementing a new treatment workflow, titled "Medium Rare Conservation." The motivations for this new workflow were clear; in addition to making the best use of the skills and newly available time of the staff technicians, this "in-between workflow" could potentially allow Conservation to serve collections more widely by making treatment available to objects that would otherwise be difficult to prioritize given competing needs and limitations. Furthermore, we hoped it would give us a chance to address a long-existing need in Library and Archives Conservation—namely, how do we treat items that have exceptional material, historical, or condition characteristics

that make them complicated to categorize beyond their collection designation?

In a University system with 24 million collection items, over 25 subject libraries, and only four full time conservators and technicians, the Medium Rare workflow provided an exciting opportunity for a small conservation staff to work together to have a wide reach. As we began the development of the new workflow, similarities with existing workflows emerged. Several aspects of Special Collection Conservation carried over as important logistical and ethical considerations for the new workflow, including transportation procedures, documentation methods, and frequent communication with collection managers. However, we also saw the need to streamline certain elements of the conservation treatment process to save time and build efficiency, much like our general collection repair practices. This was accomplished by adding a new, short-form documentation interface to our existing database, and truncating our photo-documentation process. It also meant making hard, but clear and firm decisions on what had to be excluded from the workflow, such as any item that required the use of chemical solvents or the integration or specialized working of leather or parchment.

Now, as we continue to develop Medium Rare Conservation, we are beginning to observe other benefits. Our already strong working relationships with collection managers have been augmented with close communication and a quicker turnaround of treated items. Additionally, our capable technicians are now utilizing their skills on expanded treatment opportunities rather than being limited to the batch work of general collections. Conservators can continue to focus on items that need a higher level of care and attention while also simultaneously supervising the treatment of collection items identified as Medium Rare. Slowly but surely, we are also beginning to see a rise in the number of collections served. With a deep discussion of the goals, the parameters, the benefits and, of course, the challenges involved in creating and implementing a new conservation treatment workflow, this presentation aims to offer a possible model for other institutions who face similar issues within their collections. Moreover, we also desire to solicit feedback in order to continue to grow and improve what we hope will be a successful addition to our preservation program, and ultimately, an excellent way to magnify our scope and impact on the library collections in our care.

### **Line up, Back to Back: Restoration of Korean Buddhist Sutra in accordion book format**

*Hsin-Chen Tsai, Tanya T. Uyeda*

East Asian Buddhist Sutras are sometimes mounted in accordion book format and are commonly seen in China, Japan, and Korea. Sutra text is written mostly in gold or silver on indigo dyed paper. The indigo papers were either brush or vat dyed, lined with layers of paper, and then joined together as needed. A long, horizontal section of indigo paper was folded into narrow pages, and wooden or paper covers were attached to the ends.

A Korean Buddhist sutra, Dirghagama Sutra, in ten-leaf

accordion book format with both top and bottom paper covers was brought in for treatment to the Asian Conservation lab at the Museum of Fine Arts, Boston. Many of the condition problems of this sutra were likely linked to its function as a personal religious item. For example, damage and losses due to excessive handling, an embossed circular impression likely from a vessel of some sort, substantial dirt and soiling, unknown attachments, crude repairs (tape), etc. Major treatment involving the disassembly and re-mounting of the sutra had to be considered in order to stabilize the sutra and permit its safe display.

This paper presents the examination, documentation and treatment of a Korean Buddhist Sutra. Treatment included surface cleaning, structural stabilization, disassembling, tape removal, infilling, lining and mounting. Conservators overcame several challenges such as: unifying the size of pages, infilling the missing section of the folding areas, combining the front and back with folding lines aligned. During the course of treatment, several interesting discoveries were made involving the interior structure of the sutra, as well as the materials used to create the object. It is hoped this case will be useful for the future conservation of other similar sutras mounted in accordion book format.

### Challenging the Myths Surrounding Paul Gauguin's 'Little Marvels'

*Harriet K. Stratis, Mary Broadway*

“It was a fact that Gauguin turned everything that fell into his hands – clay, wood, metal and so forth – into little marvels.”  
–Ambroise Vollard, from *Recollections of a Picture Dealer*

We are all familiar with alluring tales of an artist's “muted” palette, the “golden” patina imparted to prints and drawings by their underlying sheet tone, or the importance ascribed to a particular paper's “enhanced texture.” In this way, the effects of aging are recast as conscious artistic choices bolstered by theoretical aesthetic underpinnings that ignore evidence to suggest that certain beloved works of art may have appeared whiter and brighter when they were first produced. These canonized art historical descriptions can take on mythic proportions and propagate misinterpretation, but they may not reflect the most current understanding of an artist's materials and techniques. Only in recent decades has there been a new effort in art historical scholarship to situate artworks within the continuum of time and space; to consider their physical properties as organic and inorganic materials that alter with age, exposure to light, and mistreatment.

This talk will present a number of graphic works within Paul Gauguin's production that have been misread in the past. Careful study, scientific analysis, and insightful re-colorizations augment conservation treatment decisions to present many of the artist's sketches, wood-block prints, and transfer drawings anew. Treatments in which discoloration products are washed away and twentieth-century mounts are removed lend themselves to new, and more accurate, observations on Gauguin's process and the results he attained when using unconventional materials and methods to achieve his aesthetic goals.

Our research was carried out as part of an ambitious multi-year technical study of the Art Institute of Chicago's holdings of over 200 graphic works, 8 paintings and 3 sculptures by Gauguin, in anticipation of the museum's online scholarly collection catalogue (launched in November 2016). Art historians and conservation scientists partnered with us to present a richer and more accurate picture of Gauguin's production, taking into consideration the findings of our technical studies and the results of our treatments, incorporating them into their descriptive analyses and commentary on the artist's works in various media. The exhibition, *Paul Gauguin: Artist as Alchemist*, organized by the Art Institute and the Musée d'Orsay, celebrates this collaborative effort and will focus on the artist's response to materials and process, resulting in what the dealer and art collector Ambroise Vollard called the artist's “little marvels,” and will draw upon all of the new research into Gauguin's working methods. <https://publications.artic.edu/gauguin/reader/gauguinart>

### Sidewalks, Circles, and Stars: Reviving the legacy of Sari Dienes

*Samantha Sheesley*

History is being re-written to include critical artists that have been forgotten over time. Conservators play an important role in the revitalization of neglected objects that exemplify such visionaries. Sari Dienes is an unsung, yet pivotal, female artist of the 20th century. She was an innovative artist who countered self-expressive Abstract Expressionism with images of found objects stemming from an acute awareness of her environment. She created large-scale rubbings, often over 12 feet in length, on a medical material called Webril. Jasper Johns recalled her uninhibited nature as she unrolled the Webril in the streets of New York City and transferred the textures of manhole covers and subway grates with an inked brayer in the early hours of the morning. Both Johns and Robert Rauschenberg were greatly inspired by Dienes, describing her as a principal influence. After Dienes introduced the two, Johns and Rauschenberg collaborated on installations of the Bonwit Teller department store windows to include Dienes' sidewalk rubbing series along with one of Johns' flag paintings and one of Rauschenberg's first combines.

Despite her impact, museums did not invest in Dienes' work in the 20th century. However, friends of Dienes recognized her significance and conceived the Sari Dienes Foundation in New York. There, her rubbings and sculptures, works in process, materials, and archives are housed with the best of intentions. Unfortunately, many of Dienes' most important pieces have deteriorated and become too fragile to be considered for acquisition or exhibition by many institutions. The Virginia Museum of Fine Arts recently acquired two rubbings by Sari Dienes, one of which appears in photographs of the Bonwit Teller windows designed by Johns and Rauschenberg. Sadly, both pieces suffered numerous condition problems rendering them unfit for exhibition. These seminal pieces were not acquired in spite of their condition, but because the museum hoped to right certain wrongs of time. The delicate Webril supports were creased, torn and lacked physical

integrity. Numerous spots, stains, and accretions were scattered throughout due to corrosive staples, acidic housing materials and poor storage conditions. One piece was mounted to canvas which further contributed to unsightly discoloration, planar distortions, and physical insecurity. The novelty, scale, translucency, and fragility of the objects demanded innovation throughout the project.

A collaboration between Samantha Sheesley, VMFA Paper Conservator, Sarah Eckhardt, VMFA Curator of Modern and Contemporary Art, and Barbara Pollitt, Curator of the Sari Dienes Foundation, identified key questions surrounding the artist's work. The goal of the investigation was to better understand Dienes' materials and techniques through analysis of the objects and contextual clues found in the archives. The pooled information guided stabilization and compensation efforts culminating in the display of objects previously thought to be unsalvageable. As Dienes claims her rightful spot on the walls of museums and in the records of art history, this timely endeavor honors her philosophy and aesthetic while restoring and preserving the artifacts crafted by her hand. The VMFA's findings will benefit multiple institutions, conservators and scholars as interest in Sari Dienes work heightens through various exhibitions worldwide.

### **Ionic Fixatives on Water-Sensitive Media for Aqueous Treatment**

*Soyeon Choi*

The goal of this study is to experiment with various ionic fixatives to aid aqueous treatment of water-sensitive media on paper. Water-sensitivity of media can be attributed to different causes. In general, ionic dye molecules are dissolved into water; particles in pigment-based media are dislodged or dispersed in water due to a softening of the binder or the lack thereof. The nature of the paper support (the length of fibers, density, thickness, sizing materials, coating, and degree of aging) is also a factor in media sensitivity during aqueous treatment. When planning the use of a fixative, the important first step is to determine whether to fix the media physically or chemically, and temporarily or permanently. The choice is based on the main cause of the given water-sensitivity: colorants, binder, additives, or the characteristics of the paper substrate. Also, one has to decide what degree of change is acceptable, based on the historic or artistic value of each object. Sometimes, a small amount of color shift, or even a slight loss of media intensity, can be considered acceptable if the objects are archival in nature and their condition is to be greatly improved by the pending washing treatment. Whereas certain objects, particularly works of art, require minimal or no change during treatment; otherwise, the treatment is not justifiable.

B-72, wax, and BEVA are some of the frequently tried fixatives based on physical holding of media. These physically-holding fixatives are to be removed after the desired aqueous treatment is completed. Cyclododecane, on the other hand, is a physically holding fixative that does not require a removal step because of its sublimation characteristics. The use of ionic fixative is relatively new. In 1988, Karl Bredereck and Almut Siller-Grabenstein

published a study using ionic fixatives to improve the water fastness of ionic ink dyes when performing aqueous deacidification for archival materials. The study demonstrated that water-soluble ionic dyes could adhere more strongly onto the paper when oppositely charged fixing agents were applied to form almost insoluble complexes. The chemical bonding between the dye and the fixing agent is permanent and non-reversible. Leroy and Flieder (1993), Blüher et al. (1999), Porto and Shugar (2008) followed with more research comparing various commercially available ionic fixatives.

In this study, 13 different ionic fixatives were tried: a suspension of Mesitol NBS and Rewin EL, Appretan N 92100, Cartafix FF, Cartafix SWE, Cartafix WA, Cartafix WE, Cassofix FRN-300, Nylofixan HF, Catiofast 159(A), Catiofast 269, Catiofast 2345, Lupamin 9095, and Polymin PR971L. The samples were provided by the U.S. branches of three different companies--Achroma/Clariant, BASF, and Neschen. The study focuses on observing the interaction between these fixatives with various writing media and paper and finding application methods that are easy and relatively risk free.

### **The Challenge of Scale Revisited: Lessons learned from treatment and mounting an exhibition of 160 illuminated manuscripts**

*Alan Puglia, Debora Mayer*

This presentation will describe changes incurred to the Medieval and Renaissance manuscripts from their use in the large-scale exhibition "Beyond Words: Illuminated Manuscripts in Boston Collections." The findings will be used to evaluate and refine the treatment protocol for unstable media in illuminated manuscripts developed at the Weissman Preservation Center, Harvard Library. In addition, the presentation will offer valuable lessons learned from staff management to mount-making for this exhibition, unprecedented for its kind in scale. The presentation also serves as a critical companion to "The Challenge of Scale: treatment of 160 illuminated manuscripts for exhibition," presented at the AIC annual conference in Montreal (2016). In preparing for installation, cradle making and strapping techniques previously established for Houghton Library were evaluated and modified to suit the three exhibition venues: the Isabella Stewart Gardner Museum, the McMullen Museum of Art, and Houghton Library. Our method of making life-size drawings for oversize cradles for the Plexiglas vendor will be shared. Traditional strapping approaches were examined, materials tested for suitability, and our approach using nylon monofilament thread will be presented. Nearly all of the framed objects were mounted with a non-adhesive attachment. Our method of compiling condition checks and team approach to installation will also be discussed.

Rather than consider the project complete with installation, the senior conservators will make this an opportunity to critically review a selection of manuscripts following the exhibition. Beginning in January 2017, approximately 10% of the exhibited manuscripts will be selected and re-examined for changes. Our treatment protocol included all procedures, judgment criteria,

and a detailed documentation method using images marked in Photoshop. Conservators will closely compare the pre- and post-exhibit condition for each manuscript by which new or resurgent areas of insecure media will be clearly apparent. This level of review will allow us to determine if the protocol provided adequate stability for the rigors of exhibition including handling by researchers, imaging services, packing and transport, as well as installation. The data gathered will make it possible to identify what worked and what didn't, evaluate the accuracy of our time estimates, inform and refine the consolidation protocol, improve our project management, and ultimately refine our best practices in preserving the manuscripts in our care. In sum, the large scale of the "Beyond Words" exhibition significantly affected all aspects of the project. The team-based approach used for conservation treatment continued throughout mount fabrication, condition checking, and on-site installation work. It required the involvement of conservators with varied backgrounds and approaches to agree on standards and share workloads in order to complete high quality work in a reasonable time frame. We are keen to share what we have learned with the wider conservation community.

### **The Story Not Told: The examination and treatment of Edward Steichen's Oochens**

*Linda M. Owen, Kathryn Morales*

Edward Steichen (1879-1973) is best known as a photographer, but early in his career he was equally devoted to painting. Stylistically, his paintings related closely to his photographic output in their dark, atmospheric manner. In the early 1920's, however, Steichen began experimenting with a much bolder Modernist style that used flat planes of brightly colored geometric shapes. Steichen painted a series of 15 drawings depicting the Oochens, inhabitants of an imaginary republic, that were composed of three triangles following the Golden mean, the relationship between the extreme and mean ratio. Intended as a children's book, the Oochens were never completed or published. In 1923 Steichen had an epiphany and decided to abandon painting as a medium; he then systematically destroyed almost all of his Modernist paintings. Remarkably, the Oochens were spared and survived in his personal collection.

Bequeathed to the National Gallery of Art, the Oochens varied in condition. The majority were stable, with only minor flaking, but three exhibited severe flaking and losses to the tempera paint layer. The Oochens required consolidation and an inpainting strategy that would match the matte appearance of the paint and be as reversible as possible. A technique was developed using toned microcellulose powder sprayed with an external mix airbrush, based on a process pioneered by Elissa O'Loughlin and further developed by Rebecca Pollack. Originally the cellulose powder was used to cover foxing spots and stains or as a paper fill. In this application, the cellulose powder was toned with fluid acrylics to match the media. The cellulose and acrylic slurry was sprayed on a base coat of methyl cellulose, forming a thin, pliable, self-adhesive film. The thin sheets of inpainting material were cut to shape, positioned, and adhered in place with de-ionized

water. The inpainting fills were easily reversed with minimal moisture and left little residue behind when removed. Steichen's working methods and process were explored. His underdrawing materials and his use of a compass were observed. Steichen often created layers of opaque colors until he achieved the desired color relationships in the drawing. When possible, these underlayers were digitally reconstructed. As little is known about Steichen's materials from this period, scientific analysis was carried out to determine the paint binder and pigments, especially those in the flaking paint.

### **Re-engineering Broken Book Spines**

*Jana Dambrogio, Ayako Letizia, Mary Uthuppuru, Brien Beidler, Katherine Beattie, Emily Hishita Cohen*

Books provide a unique set of considerations for the conservator, as they seek to preserve not only the volume's historic record but in most cases also its functionality. Often, the fragility of the historic materials makes it difficult to maintain function without sacrificing the object's history, limiting a future researcher's ability to ask and answer certain questions. Thus, employing a treatment that can improve a book's accessibility while protecting its physical historic record is ideal. For more than fifty years, variations of a spine reback have been the primary option to repair books and their spine covers. The technique is effective but invasive, requiring the conservator to lift or remove original components to anchor newly added repair materials.

The treatment we propose is an innovation in book repair that will offer conservators an alternative. Originally developed by Jana Dambrogio over 15 years ago while studying and conserving two large and diverse historic collections, this treatment is tailored for books with broken spines or detached boards. The Re-engineering Broken Book Spines research group (RBBS), formed two years ago, performed variations of this treatment on more than 20 books found in the General and Special Collections of the MIT Libraries. The group will present information about how the treatments have fared on the books over the last two years including the benefits and limitations of the procedure. Often the damage occurs at the "joints" and "hinges," the flexible areas that allow the front and back covers to flex open and close. The repair uses methyl cellulose, wheat starch paste, various weights of Japanese tissues, and sometimes textiles for badly damaged or heavy books. This treatment is delicate yet sturdy, and though originally developed for non-circulating special collections, recently it has also been implemented into circulating collections. With its versatility, noninvasiveness, aesthetic sensitivity, and time and material economy, this repair results in a custom-made, functional, and historically-conscious treatment that serves well for both special- and general-collections care.

## *Art on Paper Discussion Group*

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### **Multiple Perspectives on the Treatment of Multiples: Innovative thinking on the conservation of prints**

*Moderators: Rachel Freeman, Cynthia Karnes, Harriet K. Stratis*

Prints, often produced in large numbers, present challenges for the conservator who seeks to treat them, usually in isolation from the rest of an edition. While some examples have been stored within the folds of a portfolio never to see the light of day, others have been significantly altered by long-term display, poor storage conditions, or previous restoration. Once dispersed, their condition can span the gamut from pristine to severely damaged.

How then does the conservator approach the treatment of a single isolated example from within a group of multiples, faced with the fact that the work may appear far different today than it did when first printed? Can we elucidate an artist's intent or surmise the original appearance of a print through comparison with related works? Likewise, the multiple may have sustained damage unique to it alone, appearing far different from others within a series or portfolio. Approaches to treatment can be challenging when one or more prints among a group do not look the same, although originally intended by the artist to be seen together. Is there an implied imperative to unify works that were meant to be viewed in a series?

This interactive discussion will explore the complex considerations given to the conservation and display of multiples that are often dispersed among public institutions and private collections in which their condition, appearance, and visual impact may differ enormously. Speakers will examine how the treatment of a print is shaped not only by its context within an edition or a portfolio, but also by the sometimes-divergent expectations of curators and collectors for its display among related works.

Enlivened by the discussion that will follow, session participants will be asked to contemplate the benefit of looking at multiple print editions before establishing treatment goals for an individual print, the usefulness of technical or material information that may be brought to bear when considering certain treatments, and the relevance of restoring an artist's intent well after prints within an edition or part of a portfolio have been dispersed far and wide.

### **Singular Problems in Similar Prints: The Treatment of Three 15th-Century Engravings**

*Judith (Judy) Walsh*

Ms. Walsh will present three disparate approaches to the treatment of 15th-century prints. These prints, each by a different artist or workshop, share similar dates of creation, material features, and types of damage. However, the constraints imposed by their histories, the context of their acquisition and proposed display called for divergent methods to compensate for significant losses. Ms. Walsh will elaborate on the particular importance of collegial

discussion and examination of similar prints or related states to establish treatment goals. The subjective treatment decisions mirror decisions routinely made by conservators, demonstrating that all items, even those issued as multiples, necessarily be considered and treated as "unique."

### **Editions and Treatment: Van Gelder Zonen, Arches, Rives, Montval, MBM, ...**

*Sarah Bertalan*

Ms. Bertalan will discuss how the experience of treatment is enriched when a conservator has the opportunity to treat multiples in a focused and systematic way. Multiples afford study and documentation of numerous examples of an identical paper, manufacturing process and year of production. The only variable that then informs appearance is history. Ms. Bertalan will draw from her knowledge of prints from the 19th and 20th-centuries, including multiples on Van Gelder Zonen, Arches, Montval, Rives, MBM and other fine papers used for printmaking to discuss their variable condition changes, whether they be subtle or extensive, and how they inform her treatment decisions.

### **Striking a Harmonious Tone: Wet Treatment of a Modern Print Edition**

*Anisha Gupta*

Ms. Gupta will present her recent treatment of twenty-four lithographs that comprise Ben Shahn's (American, born Lithuania, 1898 – 1969) *Rilke Portfolio* (1968). The prints were severely discolored to varying degrees, and the curators felt that the group was unfit for exhibition side-by-side. This necessitated individualized bathing and light bleaching to lighten the paper tones uniformly in batches, and reviewing the series with the curators after each bleaching cycle until acceptable paper tones were reached across the group. Ms. Gupta took spectrophotometer readings before and after treatment to quantify the color changes and to compare quantitative assessments to qualitative visual observation.

## *Library Collections Conservation Discussion Group*

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### **Unexpectedly Expert: Diversifying your skills to cover all the bases**

*Moderators: Angela Andres, Sonya Barron, Anahit Campbell*

In keeping with the general meeting theme of Innovation in Conservation and Collection Care, the Library Collections Conservation Discussion Group (LCCDG) will feature a panel of speakers, comprised of emerging, mid-career and highly experienced conservators, who will share their experiences facing a variety of professional challenges that fell outside of their immediate area of expertise. In these short talks, listed below, panelists will present examples of single-item treatments, collection care projects,

innovative ideas for lab workflows and collaborative strategies, as well as theoretical and ethical considerations inherent in their decision-making process. The presentations will be followed by a moderated question and answer discussion session between the panelists and audience.

### **3-Dimensional Objects in The Archives**

*Sonya Barron*

Description: This talk will focus on preservation concerns and strategies for a variety of 3 dimensional materials in an archives setting, including perishable items. Specific case studies will be supplemented by tips and explanations from a conservator of ethnographic and archaeological objects, with whom I was able to consult.

### **Reaching Out: Getting Help When You Need It**

*Deborah Howe*

Description: Focusing on two conservation projects which incorporated outside help and input, this talk will explore the different approaches to begin and execute treatment on a collection of papyri and a large Antiphonal.

### **To Catch a Tiger: Caring for Stitched Treasures in the Stacks**

*Elizabeth Stone, Janet Lee*

Description: When confronted with a delightful group of dolls and fabric slippers, Beth sought the guidance of Janet, relying on available technology for long-distance communication. Together they developed examination and storage methods that best suited these textile objects in a library collection.

### **Developing Leadership Skills in Conservation**

*Ashleigh Schieszer*

Description: As a young professional with new management responsibilities, what do you do if you find yourself well versed in treatment and bench work, but lacking in management and supervisory skills? In this talk, resources and personal discoveries will be shared along with examples of management challenges and the innovative solutions used to overcome them.

### **I Learned it by Watching You!**

*Suzy Morgan*

Description: Thanks to the wonders of modern technology, it's now easier and cheaper to make videos - and the field of conservation and preservation is finally starting to embrace this medium of the moment. I discovered a variety of videos that helped me improve my practices as a conservator, and learn how to safely care for some of the items in my care that were outside of my knowledge area. I also was able to use video as a teaching medium while doing a week-long conservation and preservation workshop in Myanmar, and will share tips on what worked and what needed to go back to the drawing board.

### **How Do I Build This?**

*Justin P. Johnson*

Description: This presentation will relate the experience of University of Washington staff in becoming fluent in the language of construction, engineering and design. Specific strategies for overcoming the language barrier and effectively communicating unique equipment design goals will be shared.

### **What Could Possibly Go Wrong?**

*Susan Russick*

Description: Do I have the knowledge, skills, and logistical ability to treat that object? What will happen to it if I don't? A series of mini-case studies illustrates the risks and benefits of treatment for various objects. In some cases I sought help, while in others I plunged in myself, and in many I gained the wisdom of hindsight.

## *Book & Paper Wiki Session*

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Please join us to hear updates on the progress of the BPG Wiki. Attendees will be invited to provide input to shape the development of the Wiki for the coming year. There will be a demonstration of new and improved Wiki pages, followed by an open dialogue.

At the 2016 BPG Wiki Discussion Session in Montreal, we sought feedback on the removal of the numbered outline format. There was overwhelming support for the idea. We made a template to standardize formatting going forward, and most of the pages now reflect the change. The group agreed that regular calls for bite-sized contributions would encourage participation. We have been following through on this idea with great success.

The 2017 BPG Wiki Discussion Session will be an opportunity to demonstrate the 2016-2017 changes and additions and facilitate a discussion of what to focus on in 2017-2018. The feedback that we receive during these sessions is invaluable in planning for the future of the BPG Wiki and maintaining an engaged and active membership.

## Unhappy Couples: Degradation of microscope slides due to their mounting media

*Mariana Di Giacomo*

Natural history collections are known to have used diverse forms of coatings due to the varied nature of their specimens. In the case of micro-scale organisms and histologic samples, organic coatings have been employed to mount specimens to observe them under microscopes since the first half of the 19th century. Over time, various materials have been used to improve either the stability of the mount or the clarity of the specimens for observation. Consequently, there are numerous formulas for every substance employed in microscope preparations. Some of these materials have begun to degrade, leading to the loss of very important specimens. In some cases, the salvage of degrading specimens involves remounting the specimen. This poses problems because many of these mounting media are of unknown composition, making it difficult to choose a solvent that would remove it without damaging the specimen.

A major survey is underway at the Smithsonian's National Museum of Natural History (NMNH) to identify mounting media that have held up well over time, or media that are degrading in order to determine the most appropriate treatment options. Meetings with the collections managers and curators have determined the collections to be surveyed within the museum. During examination, important features like crystallization of the mounting medium and the level of degradation are being documented. To date, over 300,000 slides have been surveyed from the Botany, Amphibians and Reptiles, Fishes, Birds, and Entomology collections. Of the total, less than 20% show signs of degradation.

However, these numbers do not reflect the real conservation issues. From the nearly 28,000 slides observed in the Botany collection, only 3% show deterioration of the mounting medium, if yellowing of Canada Balsam is not considered, given that it does not affect observation under a microscope. Of the over 96,000 slides examined in Amphibians and Reptiles, around 6% show signs of deterioration. Most of these deteriorating slides are uncatalogued, meaning that the majority of the cataloged specimens show no deterioration. In the Fish collection, of the close to 27,000 slides reviewed, around 65% have issues. Some of the slides that are in perfect condition are a result of remounting efforts, meaning that they had badly deteriorated, suggesting that the actual numbers are even higher. The collection with the least deterioration is Birds, with only 9 crystallized slides out of 3,244. The Entomology collection has been partially surveyed. Of the over 139,000 slides observed, only 7% show deterioration. The most problematic mounting media for all the collections so far have been paraffin, Permount and Hoyer's. In addition to observation of the slides, the mounting medium preferred in the Botany Department, Thermo Scientific<sup>™</sup> Shandon<sup>™</sup> Synthetic Mountant was tested at the Smithsonian Museum Conservation Institute using ATR-FTIR. It provided a very good match to a copolymer of methyl methacrylate and butyl acrylate and showed additional peaks that may be attributed to a butyl phthalate. This mountant is extremely similar to Acryloid/Paraloid B-48, which would explain why after 40 years, the slides mounted with it show no deterioration.

## Environmental Performance Assessments of Packing Cases Employed by the J. Paul Getty Museum

*Vincent L. Beltran, Kevin Marshall, Rita Gomez*

The rise in loans of cultural heritage artifacts between institutions has increased their exposure to the transportation environment. Though the duration of travel for a loaned artifact is usually brief and the artifact is buffered from the exterior environment by its packing case, the potential exists for exposure of the artifact to temperature and relative humidity conditions far exceeding the range designated by loan agreements, or episodes of shock and vibration among the greatest encountered in an artifact's lifetime. These environmental conditions may cause physical responses such as material expansion or contraction or impact from an extreme force that can damage an artifact. The Managing Collection Environments (MCE) initiative at the Getty Conservation Institute (GCI) largely focuses on the control and management of collection environments in museums. However, an object's transient period between venues represents an extension of the museum environment and, as such, research into the transportation environment is included in the MCE initiative.

Art packing and transportation has previously been an area of study, highlighted by the seminal Art in Transit conference in 1991, and this work has been instrumental in raising the level of packing worldwide. With the continued development of packing techniques and sensor technology, particularly with respect to shock and vibration, it is an opportune time to reassess the performance of packing cases currently in use. Though the majority of museums depend on assistance from outside consultants to pack museum artifacts for transport, large museums typically have experienced preparations staff with access to a range of suitable packing materials.

The Preparations department at the J. Paul Getty Museum (JPGM) has earned a reputation for employing high quality cases for the transport of loaned artifacts. They regularly use a double crate packing technique, particularly for three-dimensional pieces and panel paintings. In addition to cushioning foams common in the packing industry, Getty preparators also employ custom-designed Sorbothane rings that protect an artifact by absorbing shock and isolating and dampening vibration. Despite the prominent standing of the JPGM's Preparations department, a systematic assessment of the environmental performance of its cases has been lacking. Working alongside the Preparations team, as well as with the various conservation departments at the JPGM, the GCI's MCE initiative has conducted numerous in situ studies examining temperature, relative humidity, shock, and vibration conditions for a range of packing cases used by the JPGM to transport artifacts. Monitoring multiple packaged artifacts or mockups during the same transit also provided an opportunity to directly compare case performances when subject to identical environmental input conditions. While the bulk of monitoring occurred during ground or air transits, special attention was given to the so-called "first mile/last mile" transitions, as handling of packaged artifacts at either venue or at intermediate junctions is often thought to pose added risk of damage. It is envisioned

that this environmental assessment protocol may be applied to assess transport cases used by other cultural heritage institutions, particularly those which are commercially available.

### **Evaluation of Climate Control in Yale Peabody Museum of Natural History: Energy consumption and risk assessment**

*Lukasz Bratasz, Tim White, Catherine Sease, Nathan Utrup, Susan Butts, Richard Boardman, Stefan Simon*

Yale's Peabody Museum of Natural History (YPM) has a long tradition of improving the environmental conditions for preserving its collection of more than 13 million objects. However, results are unexpected and far from what the museum hoped for as was shown by an analysis of the current environmental conditions in three museum buildings, built in 1925, 1963 and 2001. Analysis of energy use for climate control showed that the Environmental Studies Center, the most modern Peabody Museum building, is the least energy efficient of the three and one of the least energy efficient building at Yale University. Therefore, YPM decided to reevaluate its current climate control strategy towards a more practical and responsible approach, which takes into account the historic character of the buildings and the high cost of climate control. The assessment of climate related risks to collections was the main element in the transformation process towards a new strategy of climate control. It allowed preservation priorities of the YPM collections to be identified. Finally, guiding principles of climate control were proposed that meet the preservation targets of the museum's vast collections and at the same time reduce energy consumption and lower CO<sub>2</sub> emissions.

### **Panel Discussion: A Review and Comparison of Anoxic Treatment Methods for Pest Management**

*Elena Torok, Laura Mina, Eric Breitung*

It has been over ten years since Shin Maekawa and Kerstin Elert published *The Use of Oxygen-Free Environments in the Control of Museum Insect Pests* (Getty Conservation Institute, 2003), which detailed the assembly and use of a nitrogen-based system for anoxia. Although conservators and scientists continued to develop new methods, materials, and technologies for anoxic treatments in the past decade, little of this information has been published. Each of the five panel speakers has been involved with the development and/or use of a different type of anoxic treatment setup at their institution or private practice. Variables for each of these systems range in the inert gas used, technical details of gas delivery, treatment time involved, materials associated with setup, and costs associated with assembly and maintenance. After a short introduction by the moderator, each panelist will briefly present his or her anoxic system.

Presentations will focus on the practical details, pros, and cons associated with each system's assembly, use, and cost. A moderated discussion period will follow, where systems will be compared,

potential future research needs will be discussed, and possible avenues for publication and dissemination of the information presented will be examined. The authors propose an hour for this panel overall; 30 minutes for presentations and 30 minutes for discussion. Rachael Perkins Arenstein (Conservator, A.M. Art Conservation, LLC) will speak on the use of oxygen scavengers. William Donnelly (Conservation Assistant, Winterthur Museum, Garden & Library) will speak on the use of a CO<sub>2</sub>-based system. Arlen Heginbotham (Conservator of Decorative Arts & Sculpture, The J. Paul Getty Museum) will speak on the history of anoxic treatment at the Getty and recent modifications to a nitrogen-based system. Bret Headley (Owner and Principal Conservator, Headley Conservation Services, LLC) will speak on the development and use of a nitrogen-based system. Eric Breitung (Research Scientist, The Metropolitan Museum of Art) will speak on the development and use of an argon-based system.

## **The Ballad of Little Bill: Collaboration in time-based media conservation**

*Daniel Finn, Ariel O'Connor*

The Smithsonian American Art Museum (SAAM) owns and displays a growing collection of time-based media and digital art, including significant works of art by video art pioneer Nam June Paik. In 2009, the museum acquired Paik's complete estate archive, including his writings, correspondence, notes, sculptures, and studio effects. To commemorate Paik's legacy and profound influence on the art world, SAAM holds an annual birthday celebration in his honor and invites contemporary artists to exhibit a selected piece of artwork. For the 2016 Paik birthday celebration, Film and Media Arts Curator Michael Mansfield invited Brooklyn-based artists Lilla LoCurto and Bill Outcault to present their work titled "the willful marionette." One of thirteen time-based media artworks acquired by the museum that year, it is indicative of SAAM's increasingly diverse collection of media art. The kinetic sculpture combines sculpture, software, and electronics. The eponymous marionette Little Bill (Big Bill being artist Bill Outcault) is a 3-D printed, blue PLA plastic doll designed from scanned images of the artist himself. The marionette is not controlled by human hand, but rather by custom software that interfaces between a system of eleven stepper motors that move the doll, and two Microsoft Kinect cameras which serve as the doll's "eyes." The marionette is thereby able to interact with its audience, and responds in real time to spontaneous human interaction with gestures of its own. Its range of different physical and digital components poses unique risks, a quality which is a frequent challenge to the conservation of contemporary media art. Ariel O'Connor, Objects Conservator, and Dan Finn, Media Conservator, will detail their efforts to effectively document the work's many facets during the installation and acquisition processes. The presentation aims to present a case study that is exemplary of the wide range of expertise that time-based media conservation can require, and the collaborative approach that it necessitates.

## **Digital Preservation Actions as Interventive Conservation Treatments at the Smithsonian**

*Briana Feston-Brunet, Crystal Sanchez*

At the Smithsonian Institution, stewarding digital assets is an institution-wide concern. The Institution has deployed an enterprise Digital Asset Management System (DAMS) to support this effort. The system supports all units and currently contains over 10 million image, audio, and video assets including event documentation, digital surrogates of collection objects, and component files of accessioned artworks at the Museums. Additionally, the SI DAMS uses a vendor application, bringing with it its own advantages and challenges, functionality that must be taken into account when building out a comprehensive plan for the care of specific artwork component files. The Smithsonian Museums have worked in collaboration with the Smithsonian's Office of the Chief Information Officer DAMS team to build a suite of actions

and policies around the care of artwork component files in the system, defined as the DAMS Time-Based Media Art Package, with approved package definitions and workflow checklists used by all of the participating museums. In developing the DAMS TBMA suite of preservation actions, staff members across the Smithsonian consulted the digital preservation guidelines outlined in ISO 16363, A Standard for Trusted Digital Repositories, and the National Digital Stewardship Alliance's Levels of Digital Preservation. The Hirshhorn Museum and Sculpture Garden's Conservation Team has developed their internal processes even further, defining the ingest and care of the artwork components in the system as both interventive conservation treatments and ongoing preservation actions, in accordance with the policies and processes for other material artworks. TBMA Package Reports are provided to the Museum biannually in the ongoing management of these file based artwork components. The Hirshhorn has instituted their own policies to incorporate this documentation in the artwork's ongoing condition assessment. DAMS actions are documented in the form of treatment logs in the Hirshhorn's internal systems. As the DAMS Package develops, management of these files is not only being informed by the needs of treatment, but is also influencing how that treatment is documented. In this way, digital preservation and art conservation professionals have built a shared plan drawing from both fields. Crystal Sanchez, Digital Preservation Specialist at SI DAMS, and Briana Feston-Brunet, Variable Media Conservator at the Hirshhorn Museum and Sculpture Garden, will present their work in building a preservation action framework for the care of digital artwork components in the Smithsonian DAMS. This presentation will examine the shared responsibilities in building and executing policies and actions in the framework, will explore the allocation of tasks to manage the defined requirements, and will speak more broadly to the use of an enterprise Digital Asset Management System in the care of these specific artwork component files, in its role as a preservation repository for this select class of assets. It will also provide perspectives on this choice from both the IT System Admin and the Museum Conservator roles, and provide examples from specific artworks in the collection.

## **The Role of Conservation Treatment in a Mass-Digitisation Program**

*Felicity Corkill*

Digitisation programs are frequently aimed at reducing the need for physical access to collection material, with the result that fewer resources are expended on physical preservation. This paper discusses the benefits of a mass-digitisation program where resources are provided for the conservation treatment of collections, in some cases, material that would otherwise not have received attention at this stage, thus reducing the need for more interventive treatment later. In 2012 the State Library of New South Wales, Australia (SLNSW) was awarded an AU\$61.8M state government grant to undertake a 10-year program of mass-digitisation, which aims to create 20 million digital objects. This year, the Digital Excellence Program is aiming to digitise

1.9 million items from across 33 collections using both onsite and offsite digitisers. Material formats vary widely and include books, manuscript papers, maps and plans, serials, pamphlets, newspapers, photographs and negatives, cassette, reel-to-reel and DAT tapes, film, coins, medals, oil paintings, drawings and watercolours. Mass-digitisation programs of this scale and with this variety of material formats are not common, so it is exciting to be able to work on this program, devising innovative methods of approaching mass-treatment of SLNSW's cultural heritage collections. Initial project scoping identified that 22 of the collections require input from Collection Care – over 215,000 pages of treatment and 10,500 artefacts requiring packing for offsite digitisation.

While SLNSW's Collection Care department is large, only three conservators are allocated to the digitisation program. With such a vast quantity of material, and of varied formats, requiring attention, how does Collection Care design effective preservation approaches to suit available resources of time, space, staff and materials? Innovative strategies required to realise a program of this scale. The Collection Care team works as part of a larger digitisation project team, which draws on the expertise of specialists from other departments, such as curators, archivists, librarians and digitisation specialists, as well as the support of project managers and all levels of library management. In this way judicious collection selection is undertaken, taking into account collection condition information, as well as considerations of collection rarity, value and level of use. Once collections are chosen, the second phase of the project is to determine the resources required. Collection surveys are conducted to determine the extent of stabilisation treatment required in order to image the items, and therefore the required resources of space, time, staff and materials. In order to handle these mass-treatment programs, the Collection Care team have developed innovative preservation platforms to reduce the extent of interventive treatments. In three brief project case studies, different aspects will be explored, including using cataloguing processes to gather condition information on an audio collection; the use of high-level condition assessments to inform stabilisation treatment of photographic negatives; and the importance of choosing appropriate subsets of collections to reduce unnecessary preparation. Through the practical design and successful implementation of ethical conservation treatments, SLNSW is prolonging the lifetime of their cultural heritage collections, while simultaneously providing access through mass-digitisation, providing benefits well into the future.

### **Me and My Kinetta**

*Amy Belotti*

The current landscape of art conservation faces many challenges when it comes to digitization technologies that are used to render artworks for public display and preservation. Chicago Film Archives (CFA) faced a unique challenge in acclimating the newest instance of the Kinetta Archival Film Scanner into its digitization workflow. I aim to discuss acting as the inaugural user of the machine and its operating software after a previous

instance of the scanner was revised by its two-person production team. Acquiring the scanner was a result from CFA's aspirations to expand its means of collection care through digital preservation and access efforts; the urgency of this being solidified after being granted a MacArthur Foundation MACEI award in February of 2016 with the understanding that this aspiration was to be fully underway within the year. Upon receiving the scanner in March of 2016, CFA's small staff was trained on the scanner by its creator at its Chicago-based office. From there, the staff worked to learn the workflow from notes taken during the initial training sessions and remote support from the scanner's creators; no instruction manual was available to consult as CFA offered the first set of regular users to approach the daily workings of the machine and its software. The staff faced regular calibration failures, software crashes, digital artifacts, and breakdowns of physical scanner parts. By learning how to effectively communicate issues through providing focused contexts and details about them, CFA worked with the creators of the Kinetta Archival Film Scanner to correct these recurring issues. Working through the scanner's technological and physical challenges allowed CFA to author an operations manual meant to be both relevant to future Kinetta users, as well as define a new approach to caring for the archive's collections.

### **Obsolescent Technology: The viability of the cathode ray tube used in art**

*Sara A. Moy*

The cathode ray tube (CRT) is a substantial vacuum tube used to display images in television sets, computers, automated teller machines, video game machines, video cameras, monitors, oscilloscopes and radar. It is composed of one or more electron guns and a phosphorescent screen. Like many other examples of redundant technologies, CRTs have been integral to installation and video art in galleries since the '60s. Installations and art that incorporate electronic components are often vulnerable to sustained technological development and other factors outside their physical nature, which accelerate their obsolescence. In fact, the declining production of this particular technology coupled with an increasing inability to source used CRTs has become a concern for institutions and collectors where it is integral to a work of art. While external factors influence the lifespan of a CRT, such devices generally benefit from ratings that estimate the lifespan of the instrument - typically related in number of operational hours - before the CRT becomes unreliable and/or ceases to function entirely. Due to the finite longevity of CRT technology, the need to change certain elements is unavoidable, particularly when the physical form of the CRT is essential to the functioning of many works that rely on those instruments as core components.

Today, the role of a conservator encompasses a broader understanding of preservation. Specifically, conservators no longer focus exclusively on the repair of an art object, as they are also concerned with documentation, determining the acceptability of change and managing the changes deemed necessary. Nam June Paik, who transformed video into an artist's medium with his media-based art and understood the impact of technological redundancy/

obsolescence, granted the owners of his works permission to make the technical modifications necessary to ensure their continuous operation. In preparation for the loan of “Nam June Paik: Global Visionary” to Smithsonian American Art Museum (December 13, 2012 – August 11, 2013), the conservation department at The Art Institute of Chicago embarked on a conservation project to revive one of the Paik robot assemblages in their collection, Family of Robot: Baby. Prior to the Smithsonian, Baby had not been exhibited since 2000 (at the Solomon R. Guggenheim Museum in the exhibition, “The Worlds of Nam June Paik”). This presentation will focus on the history of CRT replacement in art, the efforts conducted to maintain the CRT technology for Baby’s video playback and the viability of this overall approach. It will conclude with a discussion of works by several other artists in which changing the CRT technology for playback or as a sculptural component is impossible, and the implications that will have on those works.

### **Framing the Jones Buffer: Documenting the history and preservation of an iconic image-processing tool**

*Athena Christa Holbrook*

Since the early 1970s, video artist and engineer Dave Jones has garnered iconic status as one of the most important video toolmakers within the Western and Upstate New York media art communities. He is well-known for transferring concepts and techniques from analog audio synthesis—such as filtering, sequencing, and voltage control—to the realm of video synthesis and image-processing. His most prominent inventions include the Jones Synchronizer, Jones Digitizer, Jones Sequencer, Jones Colorizer, Jones Keyer, and the Jones Frame Buffer. Jones’ technological innovations in the creation of analog and digital tools for image-processing and generative video graphics have been invaluable contributions to the history and development of experimental video, having influenced artists such as Gary Hill, Peer Bode, and hundreds of artists-in-residence at the Experimental Television Center over the course of its 40 year legacy. His tools have served as integral devices for the creation and exhibition of video installations, many of which have since been collected and shown in numerous cultural heritage institutions. In her essay “Preserving Machines” from *The Emergence of Video Processing Tools* vol. 2, Mona Jimenez posits that video processing tools, such as those created by Jones, are best documented and preserved through collaboration between conservators, toolmakers, artists, and scholars. Responding to this call, this paper will present the findings and results of a week-long residency at Signal Culture alongside Dave Jones, as a case study in producing comprehensive and centralized documentation of a complex image-processing tool, addressing origin and development, technical specifications, conservation issues and recommendations, as well as the broader context of its enduring influence artists and the history of media art.

### **(Not) Freaking Out Over the Videofreex: Preserving a video collective archive**

*Tom Colley, Kristin MacDonough*

Video Data Bank (VDB) is a leading resource in the United States for video by and about contemporary artists. The VDB Collection includes the work of more than 550 artists and 6,000 video art titles, and work is available to exhibitors through an international distribution service. Steadfast in staying ahead of exhibitors needs, VDB has been long committed to digitization and preservation of its video archive, including the Videofreex Archive special collection. Founded in 1969, the Videofreex were one of the first video collectives in America: through the mid-1970s they produced content using newly available consumer video equipment that chronicled the counter-culture movement and broadcasted the first pirate TV station in the country from Lanesville, NY. In 2001, VDB began acquiring the Videofreex tapes from locations around the country, the majority of which are on ½” open reel. Digitizing the tapes has been a high priority for VDB, and thanks to generous donations early on, many tapes were digitized through the Bay Area Video Coalition’s Preservation Access Program. In 2014, VDB received project funding to enhance ongoing, in-house digitization activities. This presentation will discuss the work involved in preserving the Videofreex Archive, from initially acquiring, cataloging, and prioritizing the tapes, to recent in-house digitization activities – notably, obtaining and repairing ½” open reel decks, as well as cleaning and stabilizing tapes against further deterioration.

### **Overcoming Your Control Issues: Arduinos as an emulation strategy**

*Sasha Dobbs, Martina Haidvogel*

Arduinos are low-cost, open-source, and easy-to-use micro-controllers, supported by a large community. As a flexible and programmable platform, they can take input, monitor processes, create output, and connect to a number of external devices and custom electronic circuits using various protocols. Their design is tailored towards a non-technical audience, which makes them accessible tools for both advanced technicians and anyone less familiar with electronics. Originally created for artists and designers, they are found in numerous contemporary art installations. By describing two case studies, this paper explores their application as part of a conservation treatment: Bruce Nauman’s *Life Death/Knows Doesn’t Know*, 1983, a neon lights installation whose sequencer stopped working; and Anthony McCall’s *Slit Scan*, 1972, a high-speed slide projection that ran too fast with available slide projectors. While there were rather straightforward technical problems to solve, diving into each case study—together with curators and the artist or their representatives—revealed a more complex set of issues. Using Arduinos allowed for a quick change of settings and their comparison brought new facets of the works to light. With contemporary devices like these various hardware emulations are possible. Arduinos in particular have the potential to replace legacy controllers used in sequenced media

artworks that have since become obsolete or difficult to source. By introducing Arduinos to a wider audience other possible applications for conservation may be revealed, leading to further research on this innovative device.

### **The Conservation of Light: Managing a collection of light-based artwork**

*Abigail Duckor, Charlotte Eng, Terry Schaffer*

Light has a long history of use in art, but as a medium it can pose many new challenges for conservators. As soon as lighting technology becomes available on the market, it is being manipulated in contemporary art. Equally as fast, the production of these light sources becomes obsolete with the introduction of new technological innovations and additional lighting regulations. Since it is necessary to recognize artificial light sources as artists' media, it is essential to characterize them systematically in order to enable the preservation and appropriate presentation of a diverse range of light sources.

To meet the challenges of the growing collections of light-based works in museums, a documentation approach is needed. This will be necessary to maintain the original light effects of these works, particularly given the rapid changes in lighting technologies. Research was undertaken at Glasgow Museums to develop a solution for the care of the museum's collection of light-based artwork. The study evaluated whether the use of an inventory is a practical and effective way to manage a collection of light-based works in an institution. The assessment revealed many complexities when documenting various lamp types but that an inventory is a suitable strategy for managing the vital upkeep of replacement light components.

This documentation approach is currently being refined as it is applied to the collection of light-based works in the Los Angeles County Museum of Art (LACMA), where scientific instrumentation is also available. At LACMA, spectral light meters are routinely used to characterize the spectral outputs of new LED bulbs for gallery lighting. The spectral and colorimetric information that these meters provide would also be useful for lights incorporated in works of art to monitor them as they age or to evaluate replacement bulbs.

By combining the documentation strategy with scientific data on light sources, it is possible to objectively characterize light when it is used as a medium in works of art. This approach will better inform conservation decision-making and lead to enhanced preservation of light-based art objects in the future.

### **From Virtual to Reality: Dissecting Jennifer Steinkamp's software-based installation**

*Shu-Wen Lin*

As a pioneer in media art, contemporary artist Jennifer Steinkamp is critically acclaimed for her abilities to weave digital media into large-scale installations that envelop the audience vis-a-vis streams of moving images. In this paper, I use Steinkamp's animated installation *Botanic* that was exhibited in "Times Square Arts: Midnight Moment" as a case study. The goal is to discuss the implications of technological obsolescence; potential loss of quality during file re-formation and data migration, as well as pinpointing underlying threats in each stage—3D modeling, animation, rendering, and post-production—posed by incomplete documentation, missing digital components, and software incompatibility. From creation to completion, the complexity of *Botanic* not only presents technological challenges but also an ethical dilemma that contemporary conservators have been facing in the past few decades.

To a certain extent, normalization of proprietary formats and data migration can help increase the sustainability of digital objects. However, the nature of Steinkamp's *Botanic* involves CAD (Computer-Aid Design) software applications and computer-generated graphics that require meticulous care. Unless a comprehensive understanding of the born-digital objects and digital elements within the files is established—whether the element was intentionally created by the artist, is an unreproducible result by the system, or was automatically generated from software's default settings—significant translation errors can occur during file re-formation. Through carefully disassembling the artist's creation process, I attempt to focus on the internal structure and relationship between Maya, After Effects, scripts, and final deliverables.

For this analysis, I provide recommendations from macro to micro to construct a documentation system that can help future caretakers to fully understand the creation process and the usage of different digital objects. The conservation actions enable information exchange across software and emphasize migration between different versions of the same system. I aim to add a certain level of compatibility to the file; and at the same time, preserve as much information as possible for future conservators to contextualize and make accurate interpretations of the geometric-centric artifacts. I strive to provide a risk assessment that will inform museum professionals as well as the artist herself to identify sustainability and compatibility of digital elements in order to build a documentation that can collect and preserve the whole spectrum of digital objects related to the piece.

## New Research and Developments in the Conservation of Computer-based Art

*Deena Engel, Joanna Phillips*

This joint paper introduces the Guggenheim initiative “Conserving Computer-based Art” (CCBA) and the museum’s collaborative case study research with faculty and students from the Department of Computer Science of New York University’s Courant Institute for Mathematical Sciences. New methods of artwork examination and condition assessment are explored based on the authors’ cross-disciplinary study and source code analysis of computer-based artworks from the Guggenheim collection, including installations, sculptures and Internet art. The talk gives special attention to the development of conservation documentation that is informed by computer science methods and aims to serve future decision-makers of different disciplines, ranging from programmers to collection caretakers and art professionals. Guided by the objective to accommodate and establish the care of computer-based art within the greater field of contemporary art conservation, the authors investigate the conceptual anatomy and functional dependencies of the studied computer-based artworks and identify analogies and differences between them and traditional conservation objects. The authors discuss the applicability of existing conservation ethics, principles and practices to the care of computer-based art and map the needs for further research and best practice development within the field of contemporary art conservation. The research discussed in this paper presents an integral part of the Guggenheim’s current CCBA initiative to survey, save and study 22 computer-based artworks in the museum’s collection.

## Establishing a Workflow for the Preservation of Software-Based Artworks

*Patricia Falcao, Klaus Rechert, Dragan Espenschied, Tom Ensom*

Emulation has evolved over the last few years to become a viable preservation strategy and is becoming more and more common, not only in archives but also in Museum practice. In order to better understand when and how to use it, as well as what processes and infrastructure must be in place, Tate collaborated with Klaus Rechert from Freiburg University to develop a workflow, and created a report describing a framework for the use of emulation for preservation of artworks. This was made possible by PERICLES, a European funded project which focuses on evaluating and representing the risks for long-term digital conservation of digital resources. As part of that collaboration we then tested that approach in a workshop with the participation of Dragan Espenschied of Rhizome on works from the Tate’s collection. Later the same process was applied to net art pieces in Rhizome’s collection.

As illustrations, we will use two examples from the Tate Collection, “Sow Farm” by John Gerrard (T14279), “Subtitled Public” by Rafael Lozano-Hemmer (T12565), and “The File Room” by Antonio Muntadas from Rhizome’s collection. We were able to demonstrate that the proposed workflow is applicable to a very broad range of software-based artwork, from interactive

installations to web-based projects. It provides a useful tool to reveal technical boundaries of software ensembles, and discover useful technical abstractions that work across different artifacts, which in turn help to define treatment approaches. Tate is now planning to implement this process across the other works in the Collection and any new acquisitions; Rhizome is applying this process to the body of its collection.

## Do You Hear What I Hear? Documentation and Assessment of Aural Elements in Media Installation Art

*Amy Brost*

Perhaps because the visual arts predominate in museum collections, conservation documentation methods for audio in media installation art are less developed than those for video. However, the aural elements are equally complex, both technically and creatively. In works involving sound reinforcement (electronic amplification of audio signals), artists frequently work closely with audio engineers or other sound specialists to make adjustments that shape the sound within the exhibition space. This talk will propose methods for documenting these decisions and the resulting listener experience of the work. Challenges inherent to both subjective and objective methods of documentation will be discussed, drawing from the fields of acoustics, psychoacoustics, and sound engineering. In addition, condition assessment and characterization of the audio prior to installation is essential to ensure that the capabilities of the sound system are appropriate not only to the technical specifications of the digital files, but to the artist’s vision for the listener experience. This talk will include examples of inspection of audio files and streams using software applications, and examination of audio information in file metadata. Several case studies will illustrate possible application of these methods, and may include artworks with live sound performance as well as pre-recorded sound.

## SFMOMA’s Mediawiki: Prototyping a new object record

*Martina Haidvogel, Rachael Faust*

Media artworks challenge traditional documentation systems and, in our experience, reveal the limitations and restrictions of the proprietary museum software currently available. With new ways of working being formed in today’s museums, innovative systems are required that support collaborative workflows and encourage multi-user participation, all while serving the different needs necessary to keep the art at the center. Building on a rich history in this area of research, the San Francisco Museum of Modern Art (SFMOMA) has launched an internal web platform that utilizes the open-source MediaWiki software to capture, document, and distribute both concrete and contextual information around artworks. Widely supporting multi-media assets, SFMOMA’s Mediawiki can host videos, audio- and image files, a variety of

document formats, as well as link to external sources. Taking Julia Scher's iterative media installation Predictive Engineering as a case study, members of the Mellon-funded research project 'the Artist Initiative' have explored the different ways a comprehensive object record can look like and be created. This extensive research culminated in a two-day colloquium at which scholars from around the globe were invited to critique both the contents of the record as well as the technical platform. SFMOMA's Mediawiki was recently opened to all members of SFMOMA's Team Media consortium, who are now testing its usability. Their feedback and participation will inform further steps and determine if the MediaWiki platform can become a complimentary tool to our existing databases and fulfill the multi-faceted needs of documenting artworks even beyond this most challenging body of works.

### **The David Wojnarowicz Knowledge Base: A wiki-based solution for conservation and exhibition documentation**

*Glenn Wharton, Deena Engel*

The treatment of contemporary art relies on a broad range of information gathered from many sources and stored in multiple formats. Prior conservation reports, analytical results, still and moving image documentation, installation instructions, recordings of artist interviews, emails, and publications represent just some of the sources that conservators and their colleagues draw from to arrive at conservation treatment decisions. As variable works change over time from one iteration to the next, their documentation becomes the resource that defines what a work has been and can be in the future. Given its significance for future research, designing good archiving and access systems for this documentation is becoming a major topic of research. Within museums, collections management databases are the primary resources for storing information about collections. Conservators struggle to enter their documentation into these information management systems. They also strive to incorporate documentation that is archived elsewhere in various formats. They push the limits of what these databases can handle in their efforts capture all of information necessary for future treatment and exhibition decisions.

This presentation provides a model for an alternate software solution to information management for conservation: the wiki. The authors do not recommend replacing hierarchical collections management databases in museums, but they suggest that wiki software provides an option for managing complex conservation documentation in some circumstances. The strengths of wiki software include the category/subcategory functionality provided natively to group documents in unlimited and meaningful ways. Also the powerful hierarchical page/section structure allows conservators to create meaningful URLs for linking within and across webpages.

In collaboration with archivists, art historians, and other scholars at New York University, the authors combined their expertise in conservation and computer science to investigate the potential for wiki software to create an information resource for

the artist/activist David Wojnarowicz. As the first task in the larger Artist Archives Project, the David Wojnarowicz Knowledge Base is built with MediaWiki software. It contains information about the deceased artist's materials and technologies, his installations, collaborators, performances, and media works, as well as concerns for future presentation of the work of this pivotal late twentieth century artist. Early in the project, the research team decided that relationships among the elements of the artist's works would determine the nature of the underlying conceptual database. Thus the project became equally a "content" and a "technology" effort. We considered customizing an open source content management system (CMS) using an open source framework such as Drupal but that would have required considerable custom programming leading to both higher development costs and higher future maintenance costs. We selected MediaWiki for our Knowledge Base to insure a stable, open-source, user-friendly and high-performance web environment. In addition we explored configuration options and customization to the MediaWiki software in order to optimize the flexibility of the system design, to support the integration of a wide variety of documentation file formats that support conservation efforts, and to build a flexible user interface to meet the needs of conservators and others in the scholarly community.

### **Repair, Replace, and Re-make: Negotiating/ Navigating the conservation treatment of Ann Hamilton's 'at hand'**

*Briana Feston-Brunet, Stephanie Lussier, Michal Mikesell, Drew Doucette, Emily Nabsny*

Since its acquisition by the Hirshhorn Museum and Sculpture Garden in 2002, Ann Hamilton's installation "at hand"—a variable media artwork composed of audio, performative, and physical elements intended to simultaneously entice various senses—has suffered from the consequences of inaction. When the work was slated for exhibition last year, it was discovered that it had gone from a state of dormancy to obsolescence, challenging our ability to access and display the artwork. Treatment of a complex installation such as this can become more complicated with time, as perceptions change, information is lost, technologies become obsolete, and materials degrade, often necessitating increasingly significant intervention to bring it back to an active state.

In the case of "at hand," this required a thorough examination, re-evaluation, and inventory of all materials associated with the artwork from the time of acquisition in order to identify specific components and previous alterations, as well as research into the history and intent of the artwork itself. Addressing all of the components, including pneumatic and computer-operated paper dropping mechanisms, the paper, the audio files and playback equipment, and the performativity of the artwork, could only be achieved through the collaboration of media and paper conservators, media preservation specialists, audio-visual specialists, exhibitions staff, and the artist and fabricator.

The treatment itself was largely informed by the artist and fabricator, who increased our understanding of the principal

action of the artwork—dropping paper from the ceiling using a mechanized dropper unit—as not simply the dropping of paper, but as the replication of the human act of an arm moving forward and releasing paper from a hand. Treatment involved not only the practical repair of the artwork, but also the replication of obsolete components, and the replacement of others in order to bring the work back to an active state. This paper will address all aspects of the conservation of Ann Hamilton’s “at hand,” including the overall disrepair of the paper dropping mechanisms, the obsolescence and importance of the original paper, and the inaccessibility of the eight audio tracks. The priorities for conservation varied based on materials, paper or electronic, but the idea of the artwork as a type of repeatable performance, with visual, auditory, and tactile components, guided all aspects of conservation.

### **Finding Logic Within Integrated Circuits: The restoration of Stephan von Huene’s *Tap Dancer***

*Julie Wolfe, Coleman Wood*

Stephan van Huene is recognized for his acoustical sculptures—which he called “machines”—that combine movement and sound with the flip of a switch. This presentation will focus on his 1967 machine *Tap Dancer* composed of wood and leather boots that perform a three-minute tap dance atop a wooden base every half hour. It is only upon opening the base from its four sides that you realize the construction is a homemade version of an electropneumatic console for a pipe organ. The components include a network of integrated circuit boards that are wired to control recycled valves, levers, and bellows linked to percussion elements

and the swivel motion and toe tapping of the boots.

First used in the 19th century, *Tap Dancer* draws from the electropneumatic design common to the Wurlitzer organ in combination with a sound composition from wooden-headed mallets striking four wooden blocks from a xylophone—an interesting choice as some of the first Western uses of the instruments were for theatrical acts of Vaudeville. Von Huene’s machine-sculptures have many conservation issues, particularly when they are displayed and plugged in for action. The condition of the circuitry is critical to allow the boots to perform their composition, which is intended to be random by way of an EPROM-circuit connected to an E050 timing circuit. Furthermore, the re-used musical components are vulnerable to mechanical stress failure and one broken wire, shorted chip, frozen relay or erased EPROM could stop the show. His sculptures do not come with a schematic; therefore, the function of all of the parts has inherent ambiguity. It is also most common for a series of problems to occur simultaneously, making the diagnosis and restoration time-consuming and challenging even for a skilled electronics engineer.

The talk describes challenges that arose during the exhibition of *Tap Dancer* at the J. Paul Getty Museum in Los Angeles, a series of malfunctions, temporary conservation interventions, and a complete restoration after the exhibition. The paper will provide guidelines for restoring von Huene’s sculptures and can serve as a model for other works of art that incorporate early electronics. The experiences exhibiting *Tap Dancer* has provided informed conservation issues for his “machines” when challenged to exhibit them as the artist intended. The endurance of their structures are inevitably at risk—a matter of concern that will continue to resonate for conservators and curators in the future.

## The Conservation of Della Robbia Sculpture: An exhibition as initiator of work

*Abigail Hykin*

This presentation will provide an introduction and launch to a group of consecutive talks on the conservation of glazed terracotta sculpture from the Italian Renaissance. The talks will cover both recent exhibition related conservation treatment on important works of three generations of the Della Robbia family and its related workshops, and selected other non-exhibition related treatment of this material. At the Museum of Fine Arts, Boston, the exciting 2004 rediscovery in storage and subsequent treatment of Giovanni Francesco Rustici's monochromatic glazed terracotta figure of St. John the Baptist (ca 1505-15) became the impetus for a renewed focus on glazed terracotta sculpture, culminating in the exhibition *Della Robbia: Sculpting with Color in Renaissance Florence* (Museum of Fine Arts, Boston, August 9-December 4, 2016; and the National Gallery of Art, February 5-June 4, 2017). This exhibition, the first ever devoted to the Della Robbia in the United States, brought together forty-six works from 21 American collections (19 museums and 2 private) as well as several important Italian loans.

This presentation will begin by outlining how the exhibition has stimulated conservation and technical research of these works in many lending collections. Beyond the exhibition itself, works from the Della Robbia and Buglioni workshops at several other institutions and private collections have been treated and studied, both in the US and internationally. Many of these projects will be presented in related talks. As the catalyst for the exhibition, the treatment of St. John the Baptist will be described. Decisions about the extent of final compensation were made with the curatorial input and included the restoration of key missing elements (finger, hoof, and neck). The treatment revealed information about the artist's working methods as he modeled the sculpture in the round and provides a jumping off point for comparison with the Della Robbia production.

## The Comprehensive Re-Treatment of a Renaissance Terracotta Altarpiece by Benedetto Buglioni

*Rachel C. Sabino*

"Adoration of the Shepherds" was sculpted in the Florentine workshop of Benedetto Buglioni sometime around the year 1520 and bears the coats of arms of Alessandra Pazzi and Bartolommeo Buondelmonti. Significant in scale, standing at ten and a half feet tall, the altarpiece was acquired by the Art Institute of Chicago in 1924. In 2006, it was consigned to storage where it languished for the next decade awaiting its inclusion in the newly-designed galleries of Medieval and Renaissance Art which opened in March of 2017. Comprehensive examination in preparation for treatment revealed that in addition to significant damages, misalignments and disfiguring fills to its 46 sculptural ceramic segments, the wooden cradle onto which the segments had been mounted for

at least 100 years was unstable, necessitating its complete disassembly and reconstruction. All technical and treatment aspects of the dismantling, reassembly, reintegration and remounting of the altarpiece will be explored at length but several topics will specifically be highlighted. In particular, the timeframe allotted for treatment did not permit the use of standard mounts despite the fact that the weight, cantilevered position and limited surface area of many of the segments demanded additional support beyond an adhesive system. As a result, a novel solution was designed in response to this mandate.

Considerable time will also be spent outlining the myriad inherent problems in attempting to display architectural objects such as these in a context so far removed from the original and the inevitable compromises and regrets that accompany the resultant decisions. An ancillary benefit of the wholesale restoration of the "Adoration" was the unprecedented opportunity to study its construction and to reveal the features conferred on it through the processes of both fabrication and previous repair. These features and idiosyncrasies, which are perhaps unique to the Buglioni workshop—a topic little explored in either the conservation or art historical literature—will also be presented. This massive undertaking happily coincided with similar large-scale treatments being performed concurrently at multiple institutions across the country and abroad. In isolation, treatment of the "Adoration" was a monumental achievement, especially considering the scheduling constraints under which it was performed. But when viewed in the context of the broad and prodigious efforts toward similar goals by so many others during the exact same period, the treatment was even more remarkable, constituting a chapter in a unique volume of conservation history, exemplifying the singular benefits of—but also the caution needed in—cross-institutional collaboration and communication.

## Truth Versus Beauty: Maintaining visual unity in the treatment of Florentine polychrome terracotta sculpture

*Tony Sigel*

Loss compensation in sculpture can pose treatment questions that can be resolved in many different ways. Different genres, materials and surfaces call for different treatment responses, and different pressures may come to bear when the project involves privately owned works. This paper describes the visual compensation issues affecting two sculptures from the Italian Renaissance, a life-sized glazed terracotta of S. Giovanni da Capistrano, and a smaller Plaque with Winged Putto, both by Santi Buglione. Both were privately owned when originally treated. The S. Giovanni, now in the collection of the Los Angeles County Art Museum, is one of a group of three near life-sized figures of saints by the Florentine sculptor, a relation of the Della Robbia family. Each of the three figures was conserved in a different studio: two in the United States, one in Italy, and all are brought together in the current Museum of Fine Arts, Boston exhibition, *Della Robbia: Sculpting with Color in Renaissance Florence*. They provide a

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fascinating window into differences in treatment style, technique, and materials.

The author will discuss his approach to compensation for the Buglione Plaque with Winged Putto, and the S. Giovanni da Capistrano figure, which were severely damaged and suffered a variety of condition issues. One of the themes is selectivity – what to treat, and what to leave untreated. Where and how much to fill and inpaint, and where not to, to allow the original surfaces to speak of their condition and composition. What is damage to be concealed, or minimized, and what is damage to be preserved? How can the conservator avoid overtreatment and the concealment of important signs of age, composition, and inherent vice which contribute to critical patina and signal originality? How can one preserve evidence of the state of technology of the time it was made—the multiplicity of defects in the glaze and underlying original terracotta—while preserving the visual unity and coherence of the work intended by the artist? By taking the work in stages, making careful selections, and maintaining close communication with the owner/curator, these tensions may be successfully negotiated. The author will present visual evidence and describe the practical treatment methods to illustrate his work, as well as what he would do differently now.

### Conservation of 15th and 16th Century Italian Glazed Terracotta

*Leslie Ransick Gat, Erin Toomey*

Over the past 15 or so years, Art Conservation Group has worked on more than a dozen glazed Italian terracotta sculptures, many of them from the Della Robbia workshops; some small, several have been life sized. All of these works have come to us after purchase from the open market or auction house; occasionally they are brought to us by dealers. Renaissance-era painted surfaces are altered in appearance by the aging of the paint and varnish layers; however beautiful a painted Madonna and Child remains, it cannot look as it did the day of its creation. The chemistry that takes place over time, not to mention generations of restorative work, renders these surfaces vastly changed.

One of the glories of glazed ceramics is that beneath the layers of grime and old restoration, the surfaces are often beautifully preserved. If properly treated, a glazed surface cannot really be over-cleaned; removal of grime and old restoration only further reveals its original surface, its original appearance. Though there are often multiple areas of damage, adjacent surfaces largely inform the viewer as to how the whole would have looked. In essence, it is more of a viable option to strive for “an original appearing surface” on a glazed ceramic work than on any other media of the period. However, depending on context, this is not always the best objective; part of the journey of each treatment is deciding on the most appropriate extent of restoration.

As a studio in private practice, beyond our mandate to treat each object within the AIC code of ethics, our choices are also directed by the clients’ needs or the fact that they are going out to the market. While it is always appropriate to preserve some sense of an object’s visual antiquity, we consider the context the

piece will be placed when determining our aesthetic goal(s). In some cases we tip the balance more toward preserving a greater proportion of glaze or fabric losses, for example; and in some cases we lean toward carrying out more of a full restoration. The trio of Santi Buglioni’s near-life-size sculptures that were showcased in the 2015 Museum of Fine Arts, Boston exhibition, are a case in point. Aesthetic choices during our treatment Saint Bernardino, differed from Tony Sigel’s choices during his conservation of Saint John of Capistrano - a treatment that he will present in a companion talk - and both our choices differed from those of the Uffizi treatment of Saint Francis. Our part of a joint presentation with Tony Sigel will discuss our general approach for the treatment of these terracotta sculptures. We will include a review of the general materials that we use and discuss some of our choices in light of our work in the private sector.

### Tempting Fate: Lessons learned from the treatment of Giovanni della Robbia’s *Adam and Eve*

*Gregory Bailey*

Recent examination and conservation treatment of the Walters Art Museum’s large scale relief of *Adam and Eve* (27.219), attributed to the workshop of Giovanni della Robbia circa 1515, has shed new light on the complex history of this object during the 19th and early 20th centuries when it moved least four times among collections in Europe and America. On continuous view at the Walters since 1909, the relief is currently located on a stairway landing in a high-traffic area of the museum, hindering access and photography. In 2013, an unfortunate incident of damage provided the impetus for a year-long effort to examine, document, and treat the relief to provide better records of condition, stabilize loose fragments, and remove dirt, grime, and excess restoration materials. The project was conducted in close collaboration with James A. Murnaghan Curator of Renaissance and Baroque Art Dr. Joaneath Spicer.

Examination and treatment were conducted largely in the public, and physical constraints of the landing area prevented the use of solvent extraction equipment. As a result, cleaning methods were restricted to mechanical, aqueous, and low-VOC solvent methods. Frequent interaction with museum visitors, while not originally part of the treatment plan, became a valuable and highly visible form of conservation outreach in the galleries. Loose or detached fragments were consolidated with Paraloid B-72 on days that the museum was closed to visitors. Several loose sections were separated to facilitate removal of corroding iron pins. Removal of overpaint and excess fill materials revealed many sections of glazed terracotta that had long been obscured, including portions of the inscription with gaps and possible transpositions of text. Removal of restoration material from the join edges provided evidence that the relief is partly assembled from fragments and may once have been larger, surviving today in reduced form.

Examination of cleaned surfaces and glaze analysis by x-ray fluorescence spectrometry (XRF) provided evidence that many sections of glazed terracotta were manufactured in the 19th

century. The pink clay body and layered glaze structure of these newly-made pieces more closely resemble those of painted maiolica than the buff-colored clay body and single, opaque glaze layer characteristic of the della Robbia. Archival research suggests that the current assembly and newly-made sections may have been created in Italy in 1870 or before, possibly with the intent of sale to the South Kensington Museum. Integration of damages, losses, and 19th-century terracotta sections was undertaken in consultation with Dr. Spicer. Ultimately, the decision was made to tone losses and prior restorations with only minimal additional filling or resurfacing of prior fills. As a result, the appearance of the relief is unified at a distance, but damages, restorations, and differences between the two types of terracotta are visible on close inspection. The treatment of the *Adam and Eve* has thus revealed it as a complex hybrid object, combining 16th-century fragments with previously unrecognized 19th-century restorations. Additional research on 19th-century restorations in glazed terracotta is recommended, as little information on the subject is available.

## **The Gap Between Ethics and Aesthetics in Italian Restoration: Experience in the laboratories of the Opificio delle Pietre Dure in Florence, especially on della Robbia works**

*Laura Speranza, Shirin Afra*

The question of the gap (the loss of materials and colors) is perhaps the most debated argument in the philosophy of restoration to this day. Although the numerous theories on filling the gap were sometimes contradictory, all of them are still current and applicable. How do we deal with the gap in Europe and especially in Italy? How much of it do we fill? Does the restoration have to be recognizable, should I hide the pictorial retouch or should it stand out? Is there a common criterion that is applicable to all types of support? In other words, does ethics or aesthetics prevail? The essay examines some exemplary cases of restoration of polychrome sculptures, including della Robbia works, inside the restoration laboratories of the Opificio delle Pietre Dure in Florence. We analyze the criteria regarding the reconstruction of the gap in modeled works, including the use of 3D scanning technique, and the pictorial retouch in the color gap. We analyze also what we call the “dual gap,” i.e. the presence of both the modeling gap and the pictorial gap, which opens the way for a new philosophical debate between ethics and aesthetics of restoration.

## **The Treatment of Two Terracotta Architectural Reliefs by Andrea della Robbia at The Metropolitan Museum of Art**

*Carolyn Riccardelli, Wendy Walker*

The Metropolitan Museum of Art has among its extensive collection of Renaissance-period glazed terracotta two masterpieces by Andrea della Robbia (1435-1523) that have recently undergone major conservation treatment. The lunette of Saint Michael the

Archangel, which sustained extensive damage after a tragic fall in 2008, returned to The Met’s galleries in 2015 after years of meticulous reconstruction, filling, and inpainting of losses, with results that are only visible at close range. More recently, a large tondo with a central representation of the cardinal virtue Prudence was treated in preparation for the current exhibition *Della Robbia: Sculpting with Color in Renaissance Florence*, returning the piece to public view after being kept in storage for more than a generation.

While daunting, the treatment of the Saint Michael lunette was relatively straightforward, but culminated in the creation of an elegant mounting system designed and fabricated by The Met’s preparators. The new mounting system was designed to secure each of the sculpture’s original 12 interlocking sections independently while allowing the relief to be seen clearly as a whole. In addition to a review of this mount, some discussion of visual choices regarding the separation between the sections will be included in this presentation.

The massive tondo of Prudence, composed of 16 molded and modelled sections comprising a central tondo surrounded by a colorful garland, was found to be structurally unstable in its 150-year-old mount, as well as having many aesthetic issues due to previous restoration campaigns. Conservators disassembled the sections with the goal of remounting this large work in preparation for travel. Following disassembly, the sections could be more carefully examined, and the surfaces were cleaned revealing a previously unknown numbering system. This discovery led to fruitful collaboration between conservators and curators to determine the final and dramatically different arrangement of the tondo’s garland. To prepare Prudence for travel, an innovative mounting system was developed and fabricated by the conservators. Inspired by the mounting system created for Saint Michael the Archangel but modified for the more massive tondo, an aluminum honeycomb backing panel combined with carbon fiber clips allowed the tondo to travel safely and be displayed in the galleries. Details about the Prudence tondo’s disassembly process, the rearrangement of the garland sections, as well as the fabrication of the carbon fiber clips will be highlighted in this talk.

## **To B-72 or Not To B-72? Alternative Adhesives for Archaeological Ceramics**

*Elisheva Kamaisky, Rachael Perkins Arenstein*

Choosing an appropriate adhesive is one of the fundamental decisions that must be made in archaeological conservation, particularly in pottery reconstruction. The practical considerations hold implications for the treating conservator and others who will care for the material for generations to follow. As conservators gather their kits to head out to excavations across the globe each year, there are often recurring queries to colleagues and listservs on alternatives to Paraloid B-72.

This presentation will examine the variables that go into adhesive choices for archaeological ceramics with a focus on the hot climates of the Mediterranean and the Middle East. Results from an online survey documenting the current practices of archaeological conservation colleagues will be shared.

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In 2005, The Israel Antiquities Authority (IAA) began to examine its protocols for ceramic reconstruction. With limited resources and scientific capabilities at the time they collaborated with the Italian Istituto Centrale per Il Restauro (ICR) to review adhesives and reconstruction techniques used in the lab. Mowital B60HH (polyvinyl butyral resin) was determined to be the most appropriate adhesive for their treatment needs. This collaboration and the scientific process employed will be shared as a case study. A survey of historical ceramic treatments used by IAA will demonstrate the importance of a periodic review of adhesive choices. The differences in adhesive choices for field versus lab use will also be discussed. The goal of this presentation is not to recommend any single adhesive, but to examine some alternatives and the variables that inform the choice of adhesive in countries where resources, climate and other challenges may result in answers other than Paraloid B-72.

### **Structural Repair of Plaster Using Polyvinyl Butyral Adhesive Systems**

*L. H. (Hugh) Shockey Jr.*

This presentation will focus on the design and use of an adhesive system for the structural repair of plaster sculpture. The parameters influencing adhesive system design and the choice of polyvinyl butyral resins as a consolidant will be explored including methods for dealing with prior adhesive repairs, the issue of plaster's structural strength, controlled reversibility, and planned stress relief. These topics will be illustrated through the presentation of case studies of treatment and retreatment of a variety of plaster sculptures, painted and unpainted, over the course of ten years and executed by several conservators under the author's supervision. The information presented will be applicable to treatments of conservators working with plaster in a variety of formats including hollow cast, solid cast, modeled, and architectural applications.

### **Carbon Fiber Fabric and Its Potential for Use in Objects Conservation**

*Carolyn Riccardelli*

Carbon fiber fabric is a high-performance woven cloth made from carbon filament that is widely known for its applications in the aerospace, auto, marine, and sporting equipment industries. While high-strength carbon fibers became commercially available in the 1960s and more broadly obtainable for consumer use in the 1990s, we have yet to see this versatile material reach its full potential within the field of Objects Conservation.

Carbon fiber fabric is designed to be used in concert with a resin system to create rigid parts that have a modulus of elasticity comparable to steel. These polymer-reinforced carbon composites are fabricated from layers of carbon fiber cloth laminated together with epoxy. One notable benefit to the conservator is that while laying up the fabric and resin, the material can be made to conform to almost any shape. The cured composite can be quite

thin and is as strong as steel but a fraction of the weight. Carbon fiber composites are ideally suited to applications where strength, stiffness, lower weight, and outstanding fatigue characteristics are critical requirements, making them particularly well-suited for fabricating object supports and mounts.

This presentation will introduce carbon fiber fabric as a strong, lightweight material that has the potential to replace steel or brass in many conservation mounting applications, and will explore ways that carbon fiber fabric has been used in the Objects Conservation Department at The Metropolitan Museum of Art. The talk will include an overview of the material's history and manufacture as well as provide ideas on how conservators can utilize this versatile material. Details on how to choose materials and methods for working with the material will be featured.

### **So Delicate, yet So Strong: The use of paper in objects conservation**

*Paula Artal-Isbrand*

A large variety of acid-free papers offer object conservators endless options in our work. We share the use of this unique material with our colleagues in the field of paper conservation, which includes a wide range of Japanese and other Asian papers as well as Western acid-free papers. Furthermore, we have borrowed from the paper conservation field the extremely clever and elegant methods and techniques of handling and manipulating this material when we do our 3-D conservation treatments. The lure of paper lies in its properties, which superbly fit material requirements in modern conservation practice, namely reversibility, strength, inertness, permanence, stability, and minimal change in color over time. The fact that paper is light weight and non-hazardous to the conservator's health and the environment are additional advantageous properties.

Having received training in paper conservation early on in her conservation career the author has continuously applied or adapted paper conservation techniques in her objects conservation treatment work. Over time the numerous applications of paper in Artal-Isbrand's treatment work on objects became the subject of a yearly one-day seminar at the Winterthur/University of Delaware art conservation training program. The author will describe how the material paper can serve two very different functions in a conservation treatment. It can be used as a restoration material where it physically remains with the artwork once the treatment is complete, and it can also function as a tool during treatment and not remain with the artwork once the treatment is complete. In the first scenario paper can serve as a fill material, a bulking agent, a reinforcement material, a support or isolating layer or even as a "pigment" or "inpainting material." In the second scenario, it can function as a facing material, a mold material, a poultice material, a temporary support material during filling, or a material to take fine impressions. A selection of case studies will be presented. The subsequent published article will be more comprehensive, and will include a full bibliography of publications relating to this subject.

## Archaeological Glass Conservation: Comparative approaches & practicalities of using acrylic resin fills as gap fills

*Jan Cutajar, Hana Bristow*

The conservation of archaeological vessel glass is notable for the challenges inherent in loss compensation and has seen conservators creatively manipulating many materials to varying degrees of success. Conventional gap-filling techniques using epoxy resins are now widely regarded as inappropriate. One of the latest emerging techniques is the use of customisable Paraloid B-72 films, established by Koob et al. at the Corning Museum of Glass. This talk presents two alternative approaches to loss compensation in archaeological glass using acrylic resin gap fills. The authors reflect on their independent experiences in adapting this technique and consider each against the backdrop of Koob's own recommendations. The approaches described here illustrate the practicalities, challenges and conclusions drawn from the application - through trial and error - of this technique, including:

- Casting of films of varying thickness, colour, transparency & flexibility
- Experimentation & use of different resin compositions
- Shaping of fills
- Manipulation of fills and their adhesion to the glass body

The presentation highlights the similarities and differences in decision making by conservators working separately at UCL and the Royal Albert Memorial Museum (Exeter, UK), while replicating a given treatment methodology. It also advocates the use of collaboration and knowledge-sharing in tackling a conservation issue. Ultimately, through sharing these experiences, both case studies serve as a guide for conservators wishing to implement similar treatments in the future. It is hoped that in doing so, the professional conservator's repertoire for the treatment of archaeological glass will be expanded upon, allowing for the significance of fragmentary archaeological glass to be better preserved.

## An Evaluation of Cold Paste Waxes Used in Conservation for Outdoor Bronze Sculpture

*Julie Wolfe, Christina L. Simms, Alessa Gambardella, Rosie Grayburn, Arlen Heginbotham, Herant Khanjian, Joy Mazurek, Alan Phenix, Katrina Posner, Michael Schilling, Magdalena Solano, Maria Olivia Davalos Stanton, Hope Welder*

The J. Paul Getty Museum has experimented with different paste wax coatings over the past decade for the protection of outdoor bronze sculptures. Various commercial waxes have been used with noticeable changes in their performance over the years. A preferred home-made mixture was developed, starting with a blend developed by the National Park Service, and modified to raise the melting point, substituting solvents, and subtraction of the polyethylene component. Evaluating the tactic of fine-tuning a custom blend has turned into a more systematic evaluation of the pros and cons of proprietary products, lab-made paste waxes, and varying application techniques. This paper will present a candid summary

of observations made in the performance of various wax coatings used on the Museum's collection and introduce a pilot study that compares over twenty-three paste waxes applied to metal coupons.

In collaboration with the Getty Conservation Institute, the study includes a range of isolated wax types (natural, petroleum-based and synthetic), proprietary products, as well as lab-made paste waxes. The waxes were brush-applied cold to polished brass coupons, buffed, and naturally aged following ASTM standard protocol G50-10. The coupons were evaluated before and after aging using spot colorimetry and digital image analysis. The physical properties of the pastes and the effects of aging were characterized using direct melting point determination, acid value assay, solubility testing, and Fourier transform infrared spectroscopy (FTIR). Given the expectation that waxes perform differently depending on application, preliminary results for cold application have nonetheless provided some useful comparisons between the various coatings.

## Local Treatment for Outdoor Painted Metal Sculptures: Designing suitable paints for retouching

*Nikki van Basten, Ulysses Jackson, Rachel Rivenc*

Outdoor painted sculptures are constantly exposed to aggressive environments and therefore highly prone to surface damages. Surface damages are not only disfiguring but will also accelerate degradation mechanisms and in the long-term will lead to invasive and costly repainting campaigns. Local retouching can be an efficient solution to postpone these campaigns when paint losses occur on outdoor painted sculptures, as a temporary measure to restore the aesthetic integrity while preventing further damage to the exposed substrate. Carrying out unnoticeable repairs on flat monochromatic surfaces can be challenging, as is finding materials with the desirable handling properties. A wide range of materials and methods for priming, filling and retouching metal painted surfaces were investigated at the Getty Conservation Institute (GCI).

The study builds on previous research, in which primarily industrial paints were tested for retouching. While industrial paints designed for the outdoor are undeniably the more durable option, they are costly, difficult to procure in small quantities, and can be hard to apply and manipulate to obtain the desired appearance (gloss and color). At the GCI, artist's- and conservation paints usually employed indoors were tested instead, since they offer a number of advantages including their ease of handling (i.e., application, manipulation) and their availability in small quantities at low costs.

The main focus of the study was to test a number of additives to enhance the longevity of the paints investigated. In consultation with paint manufacturer Golden Artist's Colors these were: Mineral Spirits Acrylics (poly(n-butyl methacrylate)), Fluid Acrylics and Heavy Body Acrylics (both poly(n-butyl acrylate/methyl methacrylate)butyl acrylate). Paraloid B48-N (methyl methacrylate/butyl acrylate) with pigment-pastes was also included. For all paints, a variety of additives were tested, separately and in combination: adhesion promoters, UV-stabilizers and matting agents. A number of paints and additives combinations were custom formulated by

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Golden for the project. To evaluate the durability of the paints and the influence of the additives, samples with and without additives were prepared and exposed to artificial and natural aging. The natural ageing was performed in collaboration with Dow Chemicals at several of their exposure sites. For both natural and artificial aging, visual changes were recorded and FTIR-, color- and gloss measurements were carried out at regular intervals.

To assess the workability of the materials, local treatments were simulated on mock-ups. The mock-ups were exposed outdoors, to observe the long-term durability of the repairs. The data on natural ageing is still being gathered, but the artificial ageing indicated that all manipulated paints would show high outdoor durability; the modified Mineral Spirits Acrylics showed especially promising results. From a practical perspective, Fluid Acrylics were the best performers: they are easy to handle, have high hiding-power and can be applied with an airbrush, allowing for almost invisible touch-ups. The research provides technical and practical information of a broad range of materials for local treatment. If natural ageing confirms the positive outcomes of artificial aging than a possible application of the study could be to make the paint formulas commercially available to the conservation field.

### **Practical Evaluation and Application of Cleaning Techniques for Marble Sculpture**

*Raina Chao*

Cleaning marble is an involved process that can require complex decision-making along with multiple tests and treatment steps to arrive at the desired outcome. The type of object, source of soiling, desired appearance, manner of carving and finishing, and even the properties of the stone itself are factors affecting treatment choices and results. There are many treatment options for cleaning marble that can be tailored to the specific needs of an object, including: vinyl erasers, aqueous solutions, chelators, detergents, poultices, solvents, and lasers. This paper will explore the advantages and limitations of these techniques, which were investigated in preparation for the treatment of *La Première Pose* (1873-76) by Howard Roberts, a life-sized marble figure in the collection of the Philadelphia Museum of Art. This case study will be contextualized by a literature review of published cleaning techniques. While the treatment of *La Première Pose* necessitated a combination of cleaning methods executed in sequence, additional treatment examples that utilized different methodologies will also be discussed, highlighting the complex nature of the decision-making process.

### **The Use of Medical Chelating Agents for the Removal of Iron Stains From Marble**

*Anna Funke, Leah Poole, Jason Church, Dr. Mary Striegel, Martha Singer*

This study investigates the use of five different chelating agents and their efficacy both in the removal of iron stains as well as their physical and chemical effects on marble surfaces. The products tested are: ammonium citrate, cysteine, maltol, picolinic acid and thioglycolic acid. One group of samples cut from Colorado Yule were artificially stained with iron oxide while another group was left unstained. Each chelating agent was tested at two different pH values that were chosen through UV-visible spectroscopy. The samples were analyzed before cleaning and again afterwards. Colorimetry, glossimetry and laser profilometry readings were taken of all samples at each state of this study in order to establish a thorough understanding of how these chelating agents affect the physical properties of the marble surface and to quantify the effectiveness of the chelators in removing the iron stains. Surface readings of the pH values of the samples as well as FTIR spectra were also taken at each stage in order to gain a better understanding of the chemical effects that the chelating agents have on the marble surface. This study aimed to provide the data necessary to develop a treatment procedure for the removal of iron stains from historic marble that takes into consideration both the chelating agent's effect on the iron stain as well as on the marble substrate.

### **Well That Didn't Work, Now What? Stain reduction on a 10th-century Iranian ceramic**

*Claire Cuyaubère, Ellen Chase*

The conservation of a glazed earthenware dish from 10th-century Iran in the collection of the Freer Gallery of Art was a focus of a fellowship funded by the Hagop Kevorkian Foundation. Off-white in color with minimal decoration of brownish-black and red inscriptions, the dish bore disfiguring stains along most of the joins and had not been on view since 1982, as a result of its appearance. The current Curator of Islamic Art was interested in exhibiting the dish, but also concerned about the aesthetic distraction of the stains. An investigation of the stains and subsequent treatment was undertaken to reduce their visual impact. Analyses were conducted to identify the nature and source of the staining, which previously had been believed to be due to burial materials. Although a specific material was not identified, XRF, FTIR and SEM-EDS provided clear indications that the stains were instead caused by earlier treatments. The removal of old, extensive repairs revealed some deterioration to the glaze in areas and the presence of soluble salts. These parameters and limitations were taken into account during the conservation process. Various methods of stain-reduction were investigated on a few of the most stable sherds. Of the methods deemed safe for the object, none was completely effective at solubilizing or removing the staining. In fact, most had little or no effect. The ceramic was therefore treated in order to obtain a consistent appearance amongst the sherds, with as little distraction from the staining as possible.

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After the sherds were joined back together and the losses and cracks were filled, several approaches to loss compensation were considered, from different levels of integration of the stained areas to covering the most disfigured ones. As the treatment progressed, some pitfalls were encountered and the thought and decision-making processes had to evolve. The presentation aims to discuss the challenges of a particularly complex treatment and the compromises that need to be made in order to ensure the integrity and safety of an object, but also to make the object exhibitable, particularly when a treatment is not as successful as hoped.

### **The Case for Cold: Using dry ice blasting to remove lacquer coating from the King Jagiello monument in Central Park**

*Matt Reiley*

Created for the Polish Pavilion of the 1939 World's Fair, Stanislaw K. Ostrowski's "Polish King" has resided in Central Park since 1945. Treated in 1986 under the auspices of the Central Park Conservancy (CPC), the bronze was coated with Incralac, an acrylic lacquer, to protect and preserve it. In the 1980s and '90s, Incralac coatings had been used on over half of the Park's bronze monuments. The coatings have surpassed their performance life and have become cross-linked and difficult to remove. While the bronzes have maintained a tolerably good appearance, the coatings tend to obscure the surface condition and sculptural detail. In 2012, CPC devised a multi-year plan to remove all the Incralac coatings. A range of methods for the removal and the application of various coatings have been explored. The Incralac removal methods used include chemical stripping, laser ablation and most recently, dry ice blasting. The removal results inform an ongoing evaluation of the optimal means for a sustainable, cyclical coatings maintenance regime on a case-by-case basis. While each method exhibits its benefits and detractors, dry ice has some advantages that were found particularly promising in an urban park setting. Mock-up tests on the Polish King fulfilled several important criteria such as rapid, non-abrasive removal of the coating without generating untenable volumes of contaminated media. This paper presentation will compare each of the Incralac removal methods with Central Park's collection as case studies, discuss dry ice blasting operations and summarize details of an ongoing testing regime of traditional, as well as advanced corrosion inhibiting coatings and their removal and maintenance.

### **Treatment of Two Badly Damaged Egyptian Mummies and Associated Wooden Coffins**

*JP Brown, Mimi Leveque, Morgan Nau*

The Field Museum has one of the larger collections of Egyptian mummies in the United States. In 2011 and 2012, mummies not on display were CT scanned using a mobile medical CT scanner. The results prompted a temporary in-house exhibit on mummies, and then a traveling exhibit. In this paper, we discuss the analysis and treatment of Egyptian mummies in preparation for the traveling

exhibit, with particular focus on two mummies with coffins, both quite fragile: 'Minirdis' (a Ptolemaic mummy in a re-used Late Period coffin), and 'Pen-Ptah' (a Late Period mummy and coffin). The mummy of Minirdis was lying in its coffin. CT scans showed that it had suffered one or more longitudinal shocks which resulted in tearing of wrappings, separation of the legs and feet, tearing of the shroud, and severe tearing, distortion, and fragmentation of the decorative cartonnage panels. Visual examination showed that wooden elements of the coffin had separated and some elements were lost. In addition, the clay fills used to smooth the contours of the coffin prior to painting had swollen and were extremely friable. The mummy of Pen-Ptah was partially unwrapped, lying on a painted board inside its inner coffin. The head of the mummy was fully unwrapped and had detached from the mummy and was held in position by being adhered to the board. It was clear that the body had partially decomposed prior to mummification and what skin that remained on the skull was peeling away from the bone.

In this paper, we discuss the treatment and display of these two mummies and their coffins, combining as they do the ethical questions of restoration and respect for human remains and ancient religious practice, in the context of a deadline-driven exhibit preparation schedule. In particular, we look at the problems of stabilizing and restoring human remains, inverting large fragile, non-rigid objects for examination and treatment, stabilizing and restoring painted wooden coffins, reconstructing cartonnage, and using laser, computed tomography, and photogrammetric 3D imaging to document object condition and design and fabricate display and travel mounts for the treated objects.

### **Sitting Pretty: Collaborative treatment of an early Yayoi Kusama soft-sculpture chair**

*Fran Baas, Laura Eva Hartman*

This paper discusses the collaborative treatment undertaken on an early Yayoi Kusama (born 1929) soft-sculpture chair by both objects and paintings conservators at the Dallas Museum of Art. The chair is one part of *Accumulation* (1962-1964), a body of work characterized by accumulations of phallic-like soft-sculptures that would eventually evolve to full sensory environments. This body of work represents Kusama's early artistic career during the period when she first moved to New York City in 1958, and was developing in the avant-garde. *Accumulation* was requested for loan for a retrospective on Kusama, and at this point its condition, treatment needs, and travel logistics were evaluated. The chair is encased in a network of soft stuffed fabric bundles that are painted white with a thick rigid paint. Packing the object was the primary concern due to its complex surface; soft, yet brittle simultaneously. Structural treatment of the individual fabric bundles had to be addressed as several had been crushed and poked in the past. Networks of large insecure cracks had formed throughout the paint layer which had also become embedded with grime and needed to be cleaned and consolidated. Due to the complex nature of the object, both painting and object conservators collaborated to develop and enact a specialized treatment plan for this complicated and fantastic object.

## **New Technologies Applied to Restore a 19th-century Wax Medardo Rosso Sculpture**

*Lluïsa Sàrries-Zgonc*

My paper addresses this year's central theme of innovation in conservation. Using a number of cutting-edge technologies, I restored a damaged 19th-century wax sculpture by Italian modernist Medardo Rosso (1858-1928)—titled *Bambino Ebreo*, and dubbed the “McArthur” cast for this project—and to structurally reinforce it to prevent future damage. In a 2014 exhibition at Peter Freeman, Inc., New York on Rosso's work, the “McArthur” cast was shown alongside eleven other undamaged casts of the same work (in wax, bronze, and plaster).

Although the “McArthur” was in a very bad condition, it was still interesting to show it publicly because viewers were able to see part of the plaster underneath the wax. The gathering of so many examples of one of Rosso's sculptures provided an unprecedented opportunity for scientists to take detailed 3-dimensional scans of each cast in order to learn more about how each serial sculpture varies from its peers and in my initial consideration of the restoration, I realized we could use these scans to determine the likely original character of the “McArthur” cast.

I had considered the question of whether or not to intervene in the sculpture at all, given the fragility of the wax and the big portions of loss, and it became clear that using this 3-D technology was the best way to achieve my goal of reconstructing the sculpture's missing parts as faithfully as possible to the original, while intervening as little as possible. The “McArthur” cast is made of cast wax over an applied plaster core. The most disturbing damage was an earlier restoration of the nose. Also, the angle of the head was wrong. The metal axis on which the head was secured to the base was tilted towards the front and for this reason, the sculpture likely fell face first, crushing the nose and upper lip. The back of the head had several missing areas of wax and possibly plaster. The bottom front left had a loss. The left part of the neck was deformed and detached from the plaster core, as was the left part almost at the backside of the head. After deciding which other cast was the most similar to the “McArthur,” we made a 3-D head of that cast in resin and then made molds of the parts that corresponded to the damaged areas of our sculpture, which were then used to recreate the areas of wax that had been lost or damaged. Scientists had also analyzed samples of wax taken from other Rosso sculptures to determine the various wax compositions used by the artist. Studying their analysis and doing some experimentation in mixing materials, I finally found the best composite with which to restore the “McArthur” cast, and by heating that material to varying temperatures, I achieved a variation in color that perfectly matched the variations in tone used by Rosso himself.

## **The Case of the Hydrating Hydra: Examination and treatment of a Blaschka glass invertebrate model**

*N. Astrid R. van Giffen*

Leopold and Rudolf Blaschka were a father and son team of master glass workers active in and around Dresden in the 19th and early 20th centuries. They made realistic and accurate models of hundreds of invertebrate species which they sold to schools and museums all over the world. In 1885 Cornell University purchased 570 of these delicate models for their teaching collection. As teaching tools, these models were frequently handled until they were replaced by modern technologies, especially underwater photography. Like many Blaschka collections, the Cornell models were stored away and forgotten. In the 1960s they resurfaced and were sent to The Corning Museum of Glass for safe keeping. A selection of about 70 of these models were on display at the museum until January 2017.

In preparation for the exhibition, the museum's conservation team carefully examined, cleaned, and in some cases, reconstructed these delicate and unique models. Although the models are primarily made of glass, other materials such as metal wires, shells, paper, glues, resins, and paints were also used. Time and fluctuating environments have caused the structurally fragile models to suffer from deterioration of many of the components, including the glass. Conservation treatments of these complex objects required both a knowledge of the original materials, as well as an understanding of their sensitivity to water and solvents. The extremely thin glass and the sensitive surfaces of the models necessitated the development of innovative new treatments. Ethical, as well as practical, standards and protocols were developed for the treatment of the models and have proved extremely effective for minimally invasive cleaning, stabilization, and reconstruction. This presentation will focus on the examination and treatment of one model, which underwent extensive treatment. The microscopy and UV examinations of this model revealed clear signs of glass deterioration and provided new information about how the model was made. Treatment included surface consolidation, dry brush and solvent cleaning, re-assembly, and loss compensation with cast B-72 film. Treatments for a few other models will also be discussed to highlight additional conservation challenges.

## **‘Do What's Right’: The conservation of a David Hammons mud sculpture**

*Roger Griffith, Lynda Zycherman, Sasha Alexandra Drosdick*

“Do what's right,” said the artist, without looking at the sculpture or asking what treatment we proposed. During a surprise visit to MoMA's conservation studio, the infamously laconic artist David Hammons uttered these three words that encapsulate decades' worth of conservation theory and ethical debates. What does it mean to do the right thing in art conservation? The 28-inch tall, unbaked clay sculpture with wire, human hair, and black-eyed peas presents a plethora of conservation concerns. In 2013,

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MoMA acquired the sculpture in what appeared to be a deteriorated and unstable state. It required a Plexiglas<sup>®</sup> bonnet for its inaugural exhibition at the museum in 2015. As the work was being de-installed from that exhibition, a small piece of clay fell from the sculpture and landed on its base. This event, in addition to the work's condition, led us to question its overall structural stability and basic conservation maintenance.

An interview conducted with Hammons yielded some helpful information, but left us with even more questions. When asked how involved the museum should be in order to conserve the piece, Hammons deferred to the conservators: "they are the professionals." However, he went on to say that, "if they do too much it will not have the spirit." But how do conservators ascertain "the spirit" of an object without assistance from the artist? If we do nothing and the piece falls apart, how much spirit will remain then? How far can we go to save "the spirit" without losing it? Without the artist's explicit guidance, distinguishing between his intentions and the natural deterioration of the sculpture's inherently fragile materials was challenging. However, finding a

solution that would stabilize the work without diminishing its spirit was a challenge that we eagerly accepted.

To protect the spirit, we needed to attempt to define it, which we did by combining tools such as X-Radiography and technical facsimiles and research into the artist's oeuvre. Hammon's artistic practice combines bits of street flotsam and debris that in a way responds to the urban society to which Hammons is attuned. As an African American artist, he also relates his work to African traditions and spiritually protective sculpture. In the end, our desire to respect the artist's wishes and to follow our own instincts to "do what's right" in preserving the work for future exhibition and study guided our treatment decisions. So, did we "do what's right?" As with most conservation treatments, universal agreements are unlikely. Opinions and trends in art conservation are often conflicting, and a single conservator could choose to treat an object in a number of ways depending on the circumstances. When David Hammons instructed us to "do what's right," we were not sure if he knew what he was asking. But then again, maybe he did.

## **Altered States: Conservation of the Ayala Altarpiece**

*Julie Simek*

For the first time since entering the collection of the Art Institute of Chicago (AIC) in 1928, the Ayala Altarpiece has undergone a comprehensive conservation campaign to address both structural and aesthetic issues. Completed in 1396 by an unknown Spanish artist, the monumental artwork is a complete ensemble consisting of the retable (measuring 100 x 264 inches) and frontal (46 x 115 inches). Prior to acquisition by AIC, the retable's appearance had been dramatically altered by extensive overpaint applied in several restoration campaigns to mask paint loss and other damages. A tan-colored overpaint was liberally and unevenly applied over the background covering virtually all the original off-white paint in this area. The effect was a dramatic darkening of the overall tonality of the artwork, a disruption in the harmony of the color palette, and a reduction in the composition's sense of depth. Additional discolored retouchings and an aged varnish further diminished the artwork's appearance. The many challenges of the treatment included removing the tenacious overpaint, filling the extensive paint losses, and judicious inpainting to reintegrate the composition. Logistical issues faced during this large-scale project will be discussed as well, such as the handling of the three components that make up the retable, each weighing roughly 300 pounds, and the installation of the altarpiece in the museum's new The Deering Family Galleries of Medieval and Renaissance Art, Arms, and Armor that opened in March 2017. This paper also presents information on the altarpiece's construction and materials as determined by technical examination and scientific analysis. Analysis of the various paint layers confirmed the original paint binder to be egg tempera while the overpaint was found to be oil-based. Of particular interest were the discovery of the widespread use of ultramarine paint throughout the composition and the presence of oxalate-rich surface layers that contributed to the darkening of some paint colors.

## **The Monopoli Altarpiece: Rediscovery and recovery of a Cretan-Venetian masterpiece**

*Caitlin Breare*

Since 1937, the MFA has owned an enigmatic polyptych from the early 15th-century that reflects both Italian and Byzantine artistic traditions. The altarpiece is large and imposing, and would have been an exceedingly costly commission. Yet little is understood about why this unusual combination of a Cretan painting style in an Italian format altarpiece came to be used in such an important commission. Known to be from the Church and Abbey of St. Stefano in Monopoli, a town in Apulia on the heel of Italy's boot, little was understood about where the painting was produced and by whom. Relegated to storage since the 1960s as its condition rendered it unfit for display, the monumental seven-panel polyptych became the subject of a major treatment and research project begun in 2014, funded by the Lingos Family Foundation.

This is the first ever technical examination of the painting, and the first time it was unframed since 1939. The majority of the treatment has been conducted in the highly popular "Conservation in Action" space in the MFA's galleries, and education and outreach has been a key component of the project. Once the examination and treatment commenced it quickly became apparent that the original paint surface was in remarkably good condition. Furthermore, the very high quality of the painting indicated a true master was at work. The greatest treatment challenge came from the formation of calcium oxalate on the paint surface, a poorly understood phenomenon that is not uncommon, but very difficult to treat. Various cleaning methods, both traditional and novel, were explored. Surprisingly, therapy used to treat kidney stones (also comprised of calcium oxalate) may be the most effective and safe treatment method. The technical investigation led to myriad discoveries, largely due to the fact the panels had not been drastically altered during past treatment campaigns. Construction techniques, original tool marks (including on the verso, as the panels have not been thinned) and information about the original frame were all revealed. Telling techniques used for gilding, design and painting indicate a Cretan master was at work, while the construction methods, and materials suggest an Italian workshop, possibly in Venice. Collaboration with various scholars, conservators, and scientists have brought us a long way towards understanding this mysterious and monumental work.

## **Mapping a Way Forward: Bringing an artwork back from self-destruction**

*Per Knutås, Samantha Springer*

In 2009, The Cleveland Museum of Art (CMA) purchased the sculpture titled *Mapa estelar en árbol* by contemporary Mexican artist Gabriel Orozco. While the work was described as resurrecting an old-Master technique, the application of the historic materials was anything but. In construction, the work resembles a panel painting, but that the panel is a 30-40 cm thick cross-section of a mango tree trunk almost 70 cm in diameter and sits on the floor as a sculpture for viewers to walk around. Another deviation from panel painting is that instead of decorating the tangential surface of the wood, it is the end grain that bears the design. The artwork comprises wood, with canvas, gesso and graphite incised with a geometrical sgraffito design on the front and a waxy coating on the back. However, the presence of the canvas was omitted from any description and materials listing from the artist and gallery. Another discrepancy in the materials included the white ground, which was described on different occasions by the curator, artist, and gallery as gesso, dead plaster (possibly slaked lime), and calcium sulfate (plaster) and animal glue.

Upon arrival to the museum just months after its premiere showing in Mexico City, several areas of fine cracking and the beginnings of delamination were already noted on the painted surface. The sculpture was placed in storage at a stable 50% RH and upon examination a year later the surface displayed a significant change in appearance. The canvas was buckling with apparent shrinkage of the wood and large areas of gesso were being pushed

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off the surface with the cracking exponentially increased. A horror to any collection steward, the work was no longer exhibitable. The gallery was notified and it was decided that the piece should be sent back to Mexico City for examination and for a discussion with the artist.

Negotiations between the CMA, gallery, artist, and fabricator (also a conservator) led to a decision that the conservator/fabricator in Mexico City would attempt restoration knowing that CMA paintings and objects conservators deemed the work beyond conservation and that any intervention was going to be visible and show previous damage. The CMA reserved the right to reject the restored work based on appearance and would not accept the work remade in the same manner as the original. The fabricator's effort was not successful and the design elements were removed. An alternative approach to remaking the work was presented by CMA conservators prior to the treatment campaign that could potentially maintain the desired appearance but would diverge from the "traditional" materials chosen by the artist. The conservation efforts that followed were a result of several rounds of material testing and treatment discussions and collaborations with the gallery, artist, and fabricator. An overview of the testing process, the conservation intervention, level of collaboration and involvement, and ramifications to the artist's intent will be discussed.

### **Our Lady of Mercy: The discovery of a hanging scroll painting by José Gil de Castro**

*Monica Perez*

The painting "Our Lady of Mercy with St. Peter Nolasco and St. Raymond Nonnatus" signed by artist José Gil de Castro and dated in 1817, arrived at the Paintings Conservation Laboratory of the National Center for Conservation and Restoration in Santiago, Chile, for treatment during 2015. Peruvian artist José Gil de Castro lived in Chile and Argentina in the first decades of the XIX century, depicting the colonial Spanish aristocracy at first, and the leaders of the independence of these countries later. Given the importance of this artist to Chilean painting, this work was chosen to be included in the exhibition "José Gil de Castro, artist of Liberators" that would open some months later at the Fine Arts Museum in Santiago, Chile, with paintings belonging to collections from Chile, Peru and Argentina.

The painting as well as the frame show some damage. Small losses and big horizontal distortions were observed. The lower section, where the signature, date and text are located, presented long horizontal tears. There were also areas where the writing was confusing and difficult to read, and overpainting on top of the text. The varnish was quite yellow. The painting was not attached to a stretcher, but nailed to a plank of wood. After it was dismantled and analyzed, the team working on it realized it was not a regular easel painting, but a hanging scroll painting, as several others that are shown on different portraits made by Gil de Castro. On them, a small painting of a Virgin or Christ hangs on the wall, behind the person portrayed. This discovery changed completely the treatments that have been considered at the beginning, before

dismounting the painting. What had been initially considered damage transformed into traces of use, and they needed to be preserved for further study of this rare type of painting.

Finally, it was decided to perform treatments only on aspects that made difficult the understanding and appreciation of the image or were producing material damage: elimination of the yellowed varnish, application of welded stitches to tears, leveling of the surface, chromatic integration and application of a new protection layer. Since this is one of the few paintings of this type known in Chile so far, the idea is that when it is finally exhibited, the public will be able to see the specific characteristics of a hanging scroll painting.

### **Color Field Paintings and Sun-Bleaching: An approach for removing stains in unprimed canvas**

*Jay Krueger, Holly Krueger, Julia Langenbacher, Thomas Learner, Alan Phenix*

This talk presents a method for removing certain types of stains and general discoloration in the unprimed canvas of color field paintings from the 1950s and 1960s. Building upon a well-established body of research and publication in the field of paper conservation, aqueous sun-bleaching has become widely accepted as a reasonable and valuable method to consider when stain reduction in works on paper is desired. These techniques have been modified and scaled for use in treating color field paintings by Helen Frankenthaler, Morris Louis, Kenneth Noland, and other artists who employed staining techniques of paint application. The case for approaching stains in an overall manner and avoiding local aqueous treatments is made, the general parameters of the sun-bleaching treatment outlined, and a preliminary analysis of the canvas and paint media before and after treatment is described.

### **Using Butvar® B-98 as a Consolidant for Friable Matte Paint**

*Claire Winfield*

Butvar® is the trademarked name for a series of polyvinyl butyral (PVB) resins used in a wide variety of industrial applications, most notably in laminated safety glass. Commercially, PVB resins are used as adhesives, coatings, and binders and are valued for their optical clarity, adhesion to varied surfaces, rheology, toughness, and flexibility. In conservation, Butvars have been used primarily for the consolidation of deteriorated wood, but also for consolidation of stone, plaster, bone, fossils, and baskets. This paper will review the properties of Butvars and their conservation applications and will present two treatments of paintings in the collection of the Saint Louis Art Museum in which Butvar B-98 was used to consolidate friable matte paint.

The first case study, *Enforcer*, 1962, by Larry Poons, was created with Liquitex acrylic paint and Fabspray, a proprietary fabric paint with vinyl and alkyd resin binders marketed for spray-painting upholstery. While the acrylic paint was in excellent condition, the

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Fabspray was matte, highly deteriorated, and powdering off the surface of the canvas support. Several consolidants were evaluated, including Butvars of varying molecular weight, gelatin, and methylcellulose. Butvar B-98 performed best and was sprayed in several applications to consolidate the friable paint layer with minimal change to the surface sheen and gloss.

The second case study, *Micenic*, c. 1942, by Siegfried Reinhardt, is a small oil painting on pressed board. The paint layer had poor cohesive strength and was lifting from the underlying ground in local areas. Typical consolidation approaches were unsuccessful due to the friability of the paint, which crumbled under any pressure or contact. Butvar B-98 was applied to improve cohesion of the paint film and was followed by dilute BEVA 371 to set lifted paint flakes back in place. Application techniques and solvents were selected to ensure that the BEVA did not undermine the Butvar, and the two-step consolidation proved successful both structurally and aesthetically.

### **When the Dog Bites: Tear mending a large Steven Parrino painting following a dog attack**

*Laura Eva Hartman*

Steven Parrino (1958-2005) actively deconstructed painting. His technique was radical and chaotic, involving a performative aspect of folding, ripping, bending throwing and slashing painted and raw canvas. The Dallas Museum of Art was recently gifted *Black Surf* (2003), a large painting iconic to Parrino's style, represented by black glossy painted cotton duck fabric folded and twisted to create a three-dimensional composition. However, prior to receiving the painting at the museum, a large section had been ripped to shreds along one of the canvas folds. The damage was not caused by Parrino, but by the donor's dog who had become startled during a thunderstorm and attacked the painting. This paper discusses the ongoing conservation treatment and decision making process for this painting, focusing on the torn area. Traditional Heiber tear mending was used as a base treatment technique and evolved for the specific needs of this non-traditional painting. Textile conservators were consulted during this treatment, proving to be a fulfilling and necessary collaboration.

### **Conservation of Alexander Calder's Last Work *Mexico #3*: The cross-disciplinary treatment supported by SEM and TEM paint cross-section analysis using focus ion beam (FIB) sample preparation**

*Sara J. Wohler, Ralph Wiegandt*

Braniff Airways commissioned Alexander Calder to paint designs for a Boeing 727-200. Calder worked up four 1/25th scale model plane designs to commemorate relations between the United States and Mexico. Calder painted his design using blue, red, yellow, and green gouache on a fiberglass model delivered to him, prepared

with two priming layers and a layer of spray-applied white paint. He completed *Mexico #3* on November 11, 1976, the day he died. *Mexico #3* was the design Braniff chose to transfer to one of their Boeing 727-200 aircrafts.

Braniff Airways had previously commissioned two other full scale airplanes designed by Calder: *The Flying Colors of South America* in 1973, and *Flying Colors of the United States* in 1975, which was rolled out in 1976 for the United States Bicentennial. Braniff Airways officially unveiled *Mexico #3* in 1977 in Acapulco where it was dubbed "Salute to Mexico," with the expectation, at that point, to still transfer the design. Braniff ultimately decided not to transfer the design since Calder would not be present to supervise or to complete any details, as he had done on previous aircrafts.

In early 2016, I examined the privately-owned *Mexico #3* for conservation. The model had accumulated a layer of grime, and had scratches and other damages. The dirt layer obscured a varnish layer that had been applied after a number of scratches and damages had occurred; these included a couple of larger losses to one of the wing tips. Film and photographs of Calder working on *Mexico #3*, recorded by Braniff Airways, documented Calder's working processes and the model upon completion. Photos taken of the model at the 1977 event in Acapulco show several scratches which had occurred since Calder completed the model. These records were instrumental to treatment decisions. The three-dimensional nature of this painted object required an interdisciplinary approach to treatment. The historical significance of this model in Calder's oeuvre, and range of materials, merited technical analysis to gain an understanding of the artwork.

Together with the University of Rochester (URNanocenter) and Ralph Wiegandt, conservator and research scientist, we have applied advanced analytical techniques to analyze the composition of the gouache and underlying support layers of *Mexico #3*. Using scanning electron microscopy (SEM) and focus ion beam (FIB) milling to analyze cross sections in SEM by energy dispersive X-ray, and further by thin section extraction for transmission electron microscopy (TEM), we achieve elemental analysis at very high resolution. This technique offers greater precision than the more commonly used scanning electron microscopy (SEM). The results of this study will be beneficial in future treatments of Calder's Braniff models and other works by Calder.

### **Conservators as Collaborators: Working with artist Dan Colen**

*Suzanne Siano*

In 2014, "Help," an exhibition at the Brant Foundation of work by Dan Colen was installed. The exhibit included Colen's works in a wide range of media including glass, found objects, oil paint, flowers, chewing gum, Styrofoam, crack pipes and parakeets. The parakeets were part of an installation of a trash "nest" in a room adjacent to Colen's Gum paintings. Curtains made of strung crack pipes were installed to keep the birds within their designated gallery. By the time the exhibition closed -- and beckoned by the sweet scent of the gum -- the birds had managed to escape

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their gallery, parted the curtains and found a new happy place perched on and fluttering about the Gum paintings. The artist had no problem with this; the collector, on the other hand, did. This event was a reminder of what the conservator of modern and contemporary art faces today. As artists of this and the last century have explored and exploited materials, the definition of a “painting” has broadened. Butterfly wings, dust, urine, chewing gum, and a host of other materials pose new challenges to today’s paintings conservator. The preservation of these materials requires conservators to be problem solvers and collaborators while staying grounded in the ethics of our profession.

Since 2013, conservators at Modern Art Conservation have worked closely with artist Dan Colen. With the help of a large crew of assistants, Colen orchestrates the creation and production of multiple bodies of work. He uses both traditional and unorthodox materials such as chewing gum, tar, feathers, flowers and lipstick to express his artistic vision and push the boundaries of what constitutes an art material. In this quest, he, his assistants, and gallery have realized the importance of collaborating with conservators. With Colen’s rise in the art world have come challenges to balance his exploration of materials and the active market for his works with the responsibility that is upon those who sell, collect and exhibit his works. To accomplish this, the relationship between the artist and conservator has quickly grown. The conservator’s role is as technical advisor and resource, devising creative solutions and providing materials information that can extend the life of some of the more unpredictable materials Colen employs while striving not to impede upon the artist’s creative process.

This paper will address several projects on which we have worked together and the conservator’s role not only in restoring works that have already been made but also in providing technical advice in the creation of new works or when continuing a series. Reconsidering supports, media, and process has led to changes that aim to sustain the artist’s intent. The paper will explore how the artist’s working methods and his consideration of the alteration and preservation of his works have changed since working with a conservator as well as the role of the conservator in providing condition information and best practice requirements during or after the sale of Colen’s work.

### Conserving the Paintings of Romaine Brooks

*Tiarna M. Doherty*

Romaine Brooks (1874-1970) was an American expatriate living in France for most of her life. She exhibited at the Galleries Durand-Ruel in Paris and was awarded the Cross of the Legion of Honor in recognition of the service her art had rendered to France. The largest body of her work is in the collection of the Smithsonian American Art Museum (SAAM). Brooks embraced a 19th-century romantic mythology of a struggling artist even though her wealth and independence allowed her the freedom to explore both painting and drawing media for personal expression. Brooks was able to travel abroad and set up temporary studios to her specifications in order to paint a portrait of someone when it interested her. Romaine Brooks’ paintings are primarily portraits

of friends who were leading figures in the arts and humanities of France, Italy and England. To date, most art historians have focused on the biography of Romaine Brooks and the theme of sexual identity. This paper will review the painting technique of Romaine Brooks based on the examination of over 25 paintings and the conservation of 18 paintings for the exhibition “The Art of Romaine Brooks” held at SAAM in 2016. Concepts of modernity in painted subjects and formal composition will also be discussed.

Brooks’ interest in framing is found in her delineated borders on paint surfaces and exemplified in the sophisticated frame finishes found on many of her frames. Parallels between the work of Romaine Brooks and Whistler are found in the approach to framing and also the role of the artist in designing gallery exhibitions. Romaine Brooks was known for her interest and talent in interior decoration and design and it is clear that her paintings and drawings were integral to the aesthetic environments she created in her various homes.

Brooks’ knowledge of painting materials and techniques must have come from an academic setting. In 19th-century England and France, a significant amount of published information on painting technique existed. How much of this Brooks read and how much she engaged in discussions about painting practice is not known. Examining her paintings indicates that in practice she appears to have adopted her own approach to toning grounds and building up glazes. Brooks’s use of resin mixed with oil in many of her paintings has made cleaning virtually impossible. Reasons for why Brooks chose to use the mixture of media will be explored. The effects of altered colors will be evaluated in relation to paintings that do not have admixtures of resin to oil. The approach to conserving paintings for the recent exhibition will be presented. The conservation history of the paintings in the collection at SAAM will be discussed in relation to other works by Brooks in Paris. Recent choices made regarding cleaning, varnishing and retouching will be presented. The approach to lighting design in the recent exhibition will also be discussed as different filters were used to help reduce the perception of an uneven yellowed resin in the paintings.

### What the Folk Happened to Kitty James and other Folk Tales

*Nina Roth-Wells*

In summer of 2016, the Colby College Museum of Art mounted the exhibition “A Usable Past: American Folk Art.” This collection of early American folk art is very significant to the Colby Museum. A majority of the works in this exhibition belong to the American Heritage collection of Edith and Ellerton Jetté, one of the earliest collections to enter the Colby College Museum of Art. Many of these works had not been displayed for years and most were in need of extensive conservation treatments. Paintings in the collection had either received very little or no conservation in the past, or they had fallen prey to overzealous restoration attempts.

The conservation goals for this exhibition were very ambitious as over twenty paintings were conserved in just under two years. The Colby Museum does not have a conservation laboratory or a

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conservator on staff. Like many smaller New England Museums, the Colby Museum relies on the expertise of conservators in private practice. Typically, conservators in private practice form strong relationships with the institution and collection, but rarely do they have the opportunity to work closely with so many paintings for one exhibition. The scope of this project allowed for the conservation needs of many of the early 19th-century folk paintings to be assessed in a thorough manner by both the conservator and curator, thus allowing for conservation planning from the onset of the exhibition. This paper will describe how a conservator in private practice worked with museum curators and registrars to manage and plan several conservation treatments. Challenges included assessing what type of treatments could be performed on site at the museum and what types of treatments were too complex, thus necessitating transport of paintings to the conservation studio. Treatments ranged from simple surface cleanings to major structural treatments, including linings of paintings with signatures on the reverse.

During the course of the treatment of a portrait of Kitty James by Ezra Ames it became apparent that drastic changes had been made to the dress and hairstyle of the sitter. This discovery necessitated a close collaborative approach between conservator and curator. In order to examine compositional changes X-radiography was necessary. Fortunately, the local hospital performed digital radiography of the painting at no charge, allowing a small institution with no technical analysis equipment or in-house conservation staff to perform X-radiography. This informed the treatment of a significant early American portrait by a noted artist, and also prompted a re-identification of the portrait's subject.

Clues from the X-radiograph, and consultation with curators versed in early American fashion, indicated that the sitter's original neoclassical dress was from a much earlier period than the Victorian garment painted over it. Similarly, long painted locks concealed a neatly cropped hairstyle, fashionable for girls in the very early 19th century. After careful consideration both conservator and curator decided to uncover the earlier composition.

### **A Colonial Portrait and a Mystery**

*Rustin Levenson, Emily MacDonald Korth*

Conservators are often asked to discern the artist of a work, but rarely are we required to identify a subject. In a unique treatment, undertaken at ArtCare Miami, we were asked to do just that. Button Gwinnett was an elusive signer of the Declaration of Independence. Killed in a duel one year after the Declaration, his signature and image have been sought after for many years. A portrait from Georgia, his home state, was attributed to the Colonial artist Jeremiah Theus, and was purported to be of Button Gwinnett, but the image of the sitter was obscured by layers of discolored overpaint. An inscription on the reverse, first analyzed by Sheldon Keck in the 1950s, was problematic. The search for the identity of the portrait involved conservation treatment, discerning numerous previous treatments, art historical and historical research, scientific analysis, and FBI aging of a portrait of Button Gwinnett as a youth.

## **Respect for Photographs: An exploratory study of the public attitudes towards different kinds of photo restoration**

*Andy Song, Kathryn Zeng*

Museums today are more connected with the general public through their diverse exhibitions, education programs, and cultural activities. The conservation department, however, often stays behind the scenes. In the last few years, there have been a growing number of museums that expose their conservation lab to visitors, such as using glass walls, to further understanding of what conservation is and what it is meant for. For example, the conservation lab for mummies at the University of Pennsylvania Museum of Archeology and Anthropology has been a successful example for introducing historical and cultural knowledge about Egyptian mummies from a different perspective, and winning acknowledgement in return from the public for their expertise and efforts in preserving human heritage. A deeper appreciation is also developed for the exhibits set up by the museum.

The exploratory study reported in this paper is designed to understand museum visitors' attitudes towards historic photographs, when images are restored in three kinds of conditions. During the 1960s and 70s, when conservation of photographs first started, restoring the image of historic photographs through chemical treatment was often considered necessary for the preservation of the image information. As the field moved forward, this practice became much less common due to ethics discussions and good practice. Yet the desire to have a photographic object in a relatively better condition for display has remained a factor. Thanks to the development of digital technology, alternatives have been offered to enhance the photographic image without applying chemical treatments.

In this study, a 19th-century albumen print with a degree of fading and other common problems was prepared in three conditions using image restoration. 1) A high-resolution scan is made, then treated digitally for enhancement. 2) A digital negative is made from the high-resolution scan and an albumen print is made with the digital negative, following the contact printing process of the 19th century. 3) Chemical treatment is applied to the original print for image restoration. All three processes were video recorded and shown alongside the images to a group of participants recruited for the study in the Northeastern United States. Their responses were collected through interviews and a questionnaire survey and analyzed both quantitatively and qualitatively.

A historic photograph is a work of art, an object of historical importance or of sentimental attachment. The image it carries and the process that made it contain so much information that unfortunately seems to be more distant from people's understanding of photography due to the spread and dominance of digital photography. The results of this study show that the participants found it educational and inspirational to know how a historic photograph was made and what it might change under different circumstances. Such information helps them develop a respectful view about photo collections and their caretakers.

## **The Fiocruz Collections: Discussing the preservation of its photographic archives**

*Nathália Vieira Serrano*

This talk results from research carried out by the author for her Graduate Certificate in Preservation and Management of the Science and Health Cultural Heritage, at Fundação Oswaldo Cruz – Fiocruz. It discusses the “incorporation” and “disincorporation” of archival documents, proposed by Fiocruz institutional policies: Política de Preservação e Gestão de Acervos Culturais das Ciências e da Saúde and Programa de Incorporação de Acervos. The talk discusses the need of balance between objective and subjective criteria in the assessment of archival documents. It also stresses the importance of the trans-disciplinary research as an alternative to this duality, as well as the significance of the stakeholder to this discussion. This research is now being applied to the evaluation of the state of conservation of a collection of photographic documents that was initially separated to be discarded. After this evaluation, the author will propose a further assessment that considers the institutional guidelines as well as the opinion of the non-conservation technical staff of our institution.

## **Moonlight and Midnight: The evolution of Edward Steichen's 'Moonrise' prints**

*Kaslyne O'Connor, Ariel Pate, Sylvie Pénichon*

Known as the quintessential painter-photographer, Edward Steichen combined artistically renowned compositions with an excellence in technique and experimentation. He often created multiple versions of a print in order to test out the subject matter using different combinations of colors and effect. Two gum-platinum prints by Steichen, from his 1904 “Moonrise” series in the collection of the Art Institute of Chicago, illustrate his experimental attitude. Though they appear to have been printed from the same negative, each displays unique characteristics, color palettes, orientations, and titles. Historically, very little was known about the composition or creation of either of these two large-format photographs. To understand the individual elemental and material variations within these prints, and to compare known processes to those described by the artist in a correspondence, X-Ray Fluorescence and Fourier Transform Infrared Spectroscopy were performed. Characteristic signals for Prussian blue, platinum, chromium, iron, and lead were detected in both large prints. One of the works also showed clear signs of an applied varnish, which at the time was only traditionally applied to paintings. This paper proposes a tentative timeline for the creation and alteration of the works, based on the results of chemical and visual analysis and art historical research. The understanding of these two mystifying artworks has been significantly expanded due to the material analysis of these objects.

### **New Original: Reprint in fine art photography**

*Hanako Murata, Peter Mustardo, Tatiana Cole, J. Luca Ackerman*

Historically, the status of a photograph as an “original object” has been controversial in the field of fine art due to the nature of the negative/positive process itself. In other words, there can be multiple original objects. In recent years, “reprints” have emerged much more frequently in the world of fine art photography. This complicates the notion of the original and challenges conservators, curators, galleries, collectors, artist’s estates, and contemporary artists to define the “original” object in photography. Some reprints are not printed on the same photographic paper, nor even with the same process as the original object. Yet, the movement of creating “reprints” seems to be gathering momentum and is likely to continue into the future. We will certainly come across more of these prints being put forward as “new” originals. This paper will discuss some of the issues and questions surrounding “reprints” in fine art photography from the conservator’s perspective as of 2017. Further discussion will be centered around examples of reprinted objects, the reasons why reprints were made, who authorized the reprints, the need for identification and labeling, the value of reprints versus originals, the possible impact reprints have on understanding original prints and artist works, and what is an original print in photography.

### **The Re-creation and Conservation of Megaethoscope Slides**

*Monique C. Fischer*

The rarity of Megaethoscope slides and their viewers provided us with a conservation challenge: How does a conservator treat an object when there is a lack of contemporary or historic information? Does one consult a photograph conservator or objects conservator to conserve an albumen print mounted onto a curved wooden frame? What type of collaboration is needed for this project? These are the questions that arose when the North Hampton (NH) Historic Commission brought in a collection of fourteen Megaethoscope slides to the Northeast Document Conservation Center (NEDCC) to be evaluated and examined in early 2014. The paper addresses the questions above and provides a multifaceted approach to the conservation and understanding of these lesser-known photographic materials by 1) re-creating a Megaethoscope slide 2) adapting new techniques from other specialties such as mending procedures used for Japanese panel screens and 3) creating fills and inpainting for viewing in transmitted and reflected light.

The re-creation of the Megaethoscope slide was undertaken with Mark Osterman, Photographic Process Historian at the George Eastman Museum (GEM) in Rochester, NY, with funding from FAIC Individual Professional Development Scholarship Award. There were no period instructions on making mounted Megaethoscope slides. As a result, this two-day tutorial was primary research into the construction of these unique objects. Mending techniques used on Japanese panel screens were learned from colleagues with in NEDCC’s Asian art conservation department and adapted to stabilize tears in the paper supports and dust

covers of the slides. Aesthetic reintegration was carried out in transmitted and reflected lighting conditions. The multi-faceted system, re-creating a slide, adapting new techniques and aesthetic work carried out in different lighting conditions provided the basis for the conservation treatment of these slides. This paper represents a significant contribution to an area of conservation that has very little existing literature. The recreation and conservation treatment of these slides provides a better understanding of these objects and, in turn, their future preservation and conservation.

### **Bellmer: Complexities of the doll**

*Krista Lough*

Hans Bellmer (1902-1975), a German draftsman working in his own advertising company in the 1920s, strongly opposed Nazi fascism. In response to the Nazi Party, he stated he would no longer make work to support the new German state. In his revolt to German idealism, Bellmer constructed life-sized female dolls of which he photographed in provocative poses. The Nazi Party declared Bellmer’s work “degenerate” so he fled Germany and moved to Paris where he was welcomed by the Surrealists. Bellmer’s photographic production was not very large, with only around 150 images. Most of Bellmer’s photographs are small in size and often delicately hand-colored. Bellmer produced fewer than thirty large prints, many of which were mounted to board and nailed to paintings stretchers. These “stretched” large prints were often hand-colored and exhibited in a style similar to paintings. In 2014, the Art Institute of Chicago acquired one of Bellmer’s large doll photographs. The photograph is mounted to board, airbrushed overall, and overpainted with white gouache. It is missing its original stretcher although it still bears the holes from once having one. The piece has several areas with missing airbrush, giving the print areas of differential gloss. It has some large areas of loss and abrasions, which go through the print, making the brown mounting board visible. This paper will discuss the considerations, limitations, and outcomes involved when treating this rare, susceptible, one-of-a-kind photograph.

### **Current Trends and Collaborations among Heritage Institutions in Latin America: Results of the APOYOnline 1st Heritage Preservation Regional Conference and Workshop on Photographic Conservation, Fundraising & Advocacy**

*Beatriz Haspo, Amparo Rueda, Debbie Hess Norris*

From August 30 to September 2, 2016, leading preservation professionals representing 15 countries from Latin American, the Caribbean, and Spain met in Medellin, Colombia, as part of the first-ever international conference organized by APOYOnline – Association for Heritage Preservation of the Americas. Founded in 1989, formerly APOYO, has been deeply committed to strengthening exchange and global professional networks, sharing technical

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information in conservation across Latin America and the Caribbean region. This conference included 14 papers, 24 posters, special guests lectures on Fundamentals of Leadership and International Alliances in Latin American for heritage preservation professionals, the exhibit of products of preservation, and an APOYO Vision 2020 session to discuss future collaborations and activities. Participants attended a four-day workshop on photograph conservation, fundraising, and advocacy ministered by Debbie Hess Norris. This paper highlights the contents and results of the conference.

The presentations showed the current Heritage Preservation trends in Latin America. Several presentations focused on how Preventive Conservation and Risk Assessment activities have now superseded the focus on the conservation treatments of the past. There are several collaborative projects in progress among institutions of the region and critical research shared thanks to the support to APOYOnline. The lack of support and funding from government institutions has not stopped professionals from carrying out massive projects such as packing and moving a large photographic collection, using local materials and a great deal of ingenuity and resolve. The use of social media (APOYOnline Facebook page and Twitter) has increased tremendously, facilitating the exchange of critical research information, upcoming events, funding strategies, new directions on education and training, resulting in the identification of potential areas for collaborative work with AIC members. Professionals who attended this conference are very interested in forming alliances with institutions in North America to do joint research projects, and in hosting North American interns to foster and strengthen professional ties.

After the conference, a collaborative agreement between professional of three different countries was formalized to study the use of cleaning gels in murals. APOYOnline received proposals for MOUs from three important heritage institutions in Central and South America to establish training opportunities, professional exchange, research opportunities, and plan the next steps to host the 2nd APOYOnline Meeting in 2018. The participants represented major collections and holdings from cultural institutions from Argentina, Brazil, Chile, Colombia, Cuba, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Peru, United States, Uruguay, Venezuela and Spain. The meeting was sponsored by important North American and Colombian institutions and foundations, private donors, and vendors of conservation products. The conference received media coverage in Colombia, Dominican Republic, Honduras, and Uruguay in addition to social media sites. The impressive response to the conference reiterates the importance of promoting professional networking and professional development in the Latin American and the Caribbean region. APOYOnline is very proud to be the leader of this initiative.

### **Preservation of Photography in Cuba as a Historic Memory of its Evolution**

*Gloria Alvarez Frigola*

As everybody knows, conservation of any kind of collection is a requisite to assure its perdurability in time. However, this is not enough without an integrated management, to allow the socialization of the collection so it becomes part of the shared historic memory. Photography constitutes part of the visual and documental heritage of a country. This specific technique, relevant by its objectivity, historic and cultural values, chronicles the human experience with an expressive and comprehensive message, through the visual record of a cultural identity. The mission of the Photo Archive of the Office of the Historian of Havana (OHCH), founded in 1993, is to protect the graphic memory contained in its collections. Its holdings include more than 180,000 objects, including images and technological devices used to produce those images. They comprise the majority of photographic processes. This extensive archive represents the fact that Cuba was the first country in the Americas where photography was practiced and the first one to commercialize this form of art. This justifies the creation of a center that would become leader in conservation of photographs in the country, studying its evolution since it came to Cuba. The strategic proposal for the center, formulated by the author, is to display photographic collections (resultant image) and the technological devices to obtain them, as they relate each other. The integral management of these collections requires specific studies to obtain, not only a consistent museological proposal, but also develop conservation policies, to formulate a methodology for the conservation treatment of photographic collections and display of the collection.

### **Pilot Project to Treat Photogravures on Gampi Paper from Edward Curtis' 'The North American Indian'**

*Rachel Danzing, Ann Baldwin*

In 1907, Edward S. Curtis, with seed money from financier and collector J. Pierpont Morgan and support from President Theodore Roosevelt, began a herculean undertaking to publish "The North American Indian." A tribute to the "vanishing race," this monumental project had as its goal the documentation of all major surviving Native American groups living in North America. Each deluxe set included twenty bound volumes of Curtis' extensive text, illustrated with about seventy-five copper plate photogravures made from his photographs. In addition, each volume included twenty folios of larger gravures, only a small percentage of which were printed on Japanese gampi paper, the subject of this study. While most volumes of Curtis' monumental project are in various institutional hands, a photograph conservation studio received a rare set from a private collector in 2014 that would benefit from treatment to remove stains and distortions.

The set comprised 722 copper plate photogravures printed in brown ink, each presented in a Van Gelder Zonen paper window

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mat, and tipped onto a one-ply backing embossed with the stamp Cranbrook Institute of Science. A pilot project began with an initial sample group of ten representative gravures, window mats and backings, selected with the goal of establishing a reproducible treatment protocol for the entire set of 722 prints, cost estimates for materials and labor, and a time schedule for conservation treatment and re-housing. This paper describes the challenge of finding a treatment that allowed for the washing and drying of these extremely thin and reactive gampi papers while retaining their characteristic smooth and lustrous texture. Past research on the treatment of gampi papers was reviewed and incorporated into the trials. Washing techniques tested included float washing, immersion washing, and light bleaching in variously-adjusted, deionized water solutions. Drying techniques tested included: friction drying between a variety of tissues and papers; drying between various materials such as ragboard, polyester (Mylar), cotton blotters, felts, and two types of fabric membranes - a polytetrafluorethylene film (Gore-tex), and a polyester/nonwoven material (Sympatex); and stretch drying the gampi tissue between lining papers, adhered at edges, to a smooth countertop. The trials produced a range of results - some very good, but none that completely achieved the desired drying results, i.e. returning the surface texture to its original appearance. During testing, the authors consulted with several colleagues for suggestions on expanding and refining methodologies. The collaboration led to a satisfactory treatment method, a variation on a hard-soft drying package, which is described in this paper. Sustainability of materials was also considered in a final recommendation.

### Uncovering Irving Penn's Chemical Treatment Techniques

*Laura Panadero*

Irving Penn printed a series of gelatin silver photographs in 1949 and 1950, titled the *Nudes*. Regarded as a departure from the smooth, sleek forms and thin models of his fashion photography, these photographs were a chance for Penn to revel in the material possibilities of the medium. In particular, Penn was intrigued by how the photographic image could be manipulated in the darkroom to produce variable densities, ranges in image tone, and even alteration of the gelatin binder. Available sources suggest he used non-standard chemistry, specifically a bleach-and-redevelopment technique, which produced the unique visual characteristics of the *Nudes*. However, these sources, as well as the photographer's archival records from the series, include very little technical information about his process. This research was undertaken in the hopes of discovering the cause of the material modifications Penn brought about in this body of work. This paper presents the findings of research into possible darkroom methods used for the *Nudes* series.

The available art historical literature on Penn proposes a bleach-and-redevelopment process, and offers a citation for the photography manual from which Penn and his printer drew their recipes. Using this as a starting point, several hypotheses were developed for potential bleaching procedures. These hypotheses

were further refined after a survey of the *Nudes* in the collection of the Metropolitan Museum of Art, and following an interview with the printer, now in his 90s, who worked with Penn on the *Nudes*. The hypotheses sought to explain both the general technique and the specific chemistry that was used. Ultimately two bleach-and-redevelopment process were tested, as well as one process using bleaching alone.

This paper outlines the evidence in favor of each of these three darkroom techniques, including historical information, the chemical mechanisms of each, and the results of replication experiments which have been performed for each process. Preliminary XRF measurements are also presented. XRF has shown potential as a method for identifying certain bleach-and-redevelopment treatments whose chemistry may leave elemental markers in the finished print, possibly in the form of non-silver image material. Tentative results will be presented, as well as areas for further exploration. The research conducted thus far has contributed to a more complete material understanding of the *Nudes* series and is an example of how such work can complement art historical investigation.

### Providing Access to 'Overprotected' Color Slides

*Diana L. Diaz-Cañas*

Arnold Newman (1918–2006) is considered the father of the environmental portrait and one of the most influential photographers of the 20th century. He published numerous books and his photographs were frequently published in magazines such as *LIFE*, *Time*, *Scientific American*, *Vanity Fair*, *Harper's Bazaar*, and *The New Yorker*, among many others. His work is part of major museums and private collections within the United States and around the world.

In 2006, the Harry Ransom Center, University of Texas at Austin, acquired Newman's archive. Composed of 307,923 items, the archive contains negatives, color transparencies, original contact sheets, a selection of more than 2,000 prints, Newman's original "sittings" or appointment books, business files, correspondence, early sketchbooks, photographic albums, video recordings of interviews and lectures, among others.

During the cataloging process, several conservation challenges were brought to light. One of them: 16 sets of Kodachrome color transparencies, with a total of 117 individual transparencies, were wrapped with three different pressure sensitive tapes, and apparently randomly labeled. This configuration blocked the access to the images and represented a conservation problem since the tapes were in direct contact with film supports and emulsion layers. Tests were performed to find the safest way to remove tapes and adhesive residues. Paper conservation techniques were, once again, successfully applied in the conservation of photographs, in this case with plastic supports and color dyes as the image-forming material. Conservation treatments allowed access to the image content, thus enabling completion of cataloging process and pairing the slide label information with Newman's cataloging system, and ultimately allowing access of his entire archive to scholars and researchers interested in his creative process.

### **Conservation Science 2.0: The Northwestern University / Art Institute of Chicago Center for Scientific Studies in the Arts**

*Francesca Casadio, Marc Walton, Monica Olvera de la Cruz, Emeline Pouyet, Johanna Salvant, Ken Sutherland*

The Northwestern University/Art Institute of Chicago Center for Scientific Studies in the Arts (NU-ACCESS) was founded with a generous grant of \$2.5M from the Andrew W. Mellon Foundation as a collaborative endeavor in conservation science that pursues objects-based and objects-inspired scientific research to advance the role of science within art history, curatorial scholarship, archaeology, and conservation. By leveraging resources at the Art Institute (AIC) and materials-related departments at Northwestern University (NU), the center – the first of its kind – is developing, harvesting and adapting innovations in other fields to advance our capabilities of studying, preserving and treating art. Within the Northwestern campus, it is serving as a catalyst to inspire and direct new cutting edge research in academia focused on cultural heritage, with accomplishments in analytical science, modeling, visualization, data fusion and data processing as demonstrated by over 40 peer-reviewed publications to date. The Center also brings scientific equipment and expertise to collections that have no such talent in house (most recently, for example, the Guggenheim museum in New York, the Georgia O’Keeffe museum in Santa Fe, and the Musée National Picasso in Paris, France). This research and education initiative also provides enhanced training opportunities for participants through involvement in university-museum multidisciplinary programs, early career internships, postdoctoral fellowships and visiting scholars’ opportunities. Now in its fourth year of operation, the center is internationally recognized as a model of interdisciplinary scientific research in the arts. Since its creation, the Center has focused on a broad variety of projects on materials ranging from archaeological glass and paintings to modern bronzes and artworks pursuing objectives as diverse as collecting materials evidence for dating, advancing knowledge for technical art history, enhancing conservation and exhibitions and developing new technologies. To date, more than fifty proposals have been submitted from all around the world, demonstrating the great need of such a resource for museums that have the intellectual curiosity but not the scientific expertise in house. In this talk we will provide select examples of NU-ACCESS projects to illustrate the center’s role as a sustainable model for integrating scientific investigation into the next generation museum practice.

### **What Can Nanotechnology Do for Us? Evaluating novel cleaning tools through the NanoRestArt project at Tate**

*Dr. Lora Angelova, Rachel Barker, Gates Sofer*

Tate is currently a partner in the Horizon 2020-EU funded project “Nanorestart” – a multinational research initiative to introduce nanotechnology solutions to the conservation and preservation challenges of modern and contemporary art. The project aims to

address four distinct conservation challenges: (1) the controlled surface cleaning of contemporary materials, (2) the stabilisation and consolidation of canvases and painted layers (3) the development of sensors and substrates for enhanced molecular detection and analysis, and (4) the creation of enhanced protective coatings. All of the tools and materials being investigated aim to introduce nanotechnologies such as nanocontainers, nanoparticles, nanosensors, etc., to the collection care toolbox.

Tate’s role in Nanorestart is primarily focused on the evaluation of novel cleaning systems which include highly-retentive gels for the confinement of enzymes and nanostructured fluids based on green surfactants. Over the course of the project, we will carry out analyses and treatments on three artworks from the Tate collection in conjunction with sculpture and paintings conservators. The artworks include a plastic object, an acrylic (solution) painting, and an acrylic (emulsion)-painted mixed media object. Each treatment will be approached as a complete case study and will include extensive scientific analyses and technical examination, preparation of mock-ups, characterisation of the mock-up surfaces before, during, and after treatment with a large suite of systems (including those currently available to conservators), evaluation of the optimal cleaning approach based on scientific and conservator evaluations, and finally, the surface cleaning treatment of the artwork.

The process and results from our first two case studies will be presented in detail: Michael Dillon’s *Op Structure*, 1967, and progress made on Roy Lichtenstein’s *Whaam!*, 1963. Dillon’s Perspex® (poly(methylmethacrylate)) Op Art object does not show significant signs of degradation; however, the surface has areas of fingerprints and light soiling, and there are two different types of adhesive labels which will be removed. The high gloss and susceptibility of the polymer to solvent cleaning and abrasion make this treatment complex and very relevant to contemporary art collections. At present, mock-ups based on the artwork materials have been prepared and characterised; more than 60 treatment options will be explored for soiling and adhesive removal prior to approaching the artwork. Lichtenstein’s iconic piece is painted primarily with Magna acrylic solution paints, as well as oils and oil-modified alkyds. The “seam” between the two canvases of the painting’s composition has become distracting due to surface soiling and other marks. This case study will commence at the start of 2017, and the results, challenges, and the decision-making process leading up to the treatment (to date) will also be presented.

The research for this study received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646063.

### **Sculpting in Color: The innovative glazes of the della Robbias and followers in Renaissance Florence**

*Richard Newman, Abigail Hykin*

The Florentine sculptor Luca della Robbia began to develop and perfect an innovative glazing technique for terracotta sculpture around the middle of the 15th century. Building on these experiments, the della Robbia family workshop produced glazed terracotta

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reliefs over the next century that were highly popular and widely admired. A rival workshop was established by Benedetto Buglioni, and some other artists also produced sculptures that featured bright, opaque glazes inspired by the della Robbias. In association with two special exhibitions at the Museum of Fine Arts, Boston, including the recent “Della Robbia: Sculpting with Color in Renaissance Florence” (August 9-December 4, 2016), the glazes from nearly two dozen sculptures by the della Robbias and followers have been studied over the past ten years. An early 20th century reproduction by the Florentine Catagalli workshop has also been studied.

Although the majority of the studied objects are from the Museum of Fine Arts, Boston, several are from other American collections. The research has involved extensive collaboration with the MFA's curator of European decorative arts and conservators at the MFA and other institutions. Sculptures from all generations within the della Robbia workshop have been included as well as several from the Buglioni workshop. This research, mainly carried out by examination of cross sections by scanning electron microscopy/energy-dispersive X-ray spectrometry (SEM/EDS), adds to the previously-published body of work by scientists in France and Italy. The European researchers have studied ceramic bodies and glazes, utilizing various analytical techniques. The work carried out at the MFA combined with the European research provides many insights into the nature of the della Robbias' innovations and the variations with their workshop; the research also makes it possible to examine relationships between the work of the della Robbias and that of other artists inspired by them. The della Robbias' techniques did not involve new materials, as their glazes have many affinities with those of contemporary majolica objects, but instead represent a focus on certain combinations of the raw materials that were carefully developed to produce particularly bold opaque colors made to carefully fit the underlying ceramic bodies on which they applied, so firing often produced no significant cracking in the glazes. This paper briefly summarizes previously published work and highlights findings from the unpublished work at the Museum of Fine Arts, Boston. The paper provides scientific analysis on objects that are the subject of several treatment-related papers submitted to the Objects Specialty Group.

### **Early Intervention for At-Risk 21st Century Fugitive Media**

*Dr. Fenella France, Meghan A. Wilson, Chris Bolser*

Effectively controlling the environment to reduce the need for invasive treatments is the goal for all heritage professionals. While significant attention is directed to historic materials, we all too often fail to recognize the more modern at-risk challenges in our collections. These risks can include both the impact of various storage environment parameters as well as challenges of display. Previous research has shown that significant changes in chemical and physical properties often occur early in the lifetime of historic and modern objects for a range of materials with the rate of change decreasing over time. This was true for the Star-Spangled Banner, with the interaction between keratin (wool) and dyes showing the photo-protective effect of some of the dyes on the chemical and

mechanical degradation. One additional challenge is that most collections have experienced use, display or natural aging before they enter controlled collection storage environments.

Research to determine environmental impact on modern felt-tip pens used on drawings in the Herb Block Collection at the Library of Congress led to exploration of light, dark and temperature effects, since the collection materials seemed to be both photo and thermally unstable. Curatorial staff observed fading in collection items that had never been exhibited or exposed to light. To assess these chemical changes, reference pen samples that replicated those used in these 21st century cartoon drawings were created and the media separated by thin layer chromatography (TLC) into its component dyes. This was to assess the relative light sensitivity of each of the dye components to identify what pens put specific drawings at greater risk. These penstix, sharpie, rub-a-dub and other felt-tip media samples were also drawn out on a range of substrates to assess the interaction between substrate and media.

Samples were then placed in controlled light, dark and cold storage environments for successive periods of time and examined progressively over a period of 18 months. At the same time collection items containing the same media were kept in dark and cold storage environments. Both the TLC reference samples and collection items were examined non-invasively with spectral imaging to track any changes over time in response of the media to different natural aging storage environments. Media samples on various substrates were exposed to accelerated aging environments – light (with/ without ultraviolet) and dark, both with controlled temperature and relative humidity.

Additional examinations were made using a microfade-tester (MFT) to determine a relative light sensitivity between the various media. Analysis of changes in substrate materials were also undertaken. Results indicated significant differences over time in sensitivity to light and dark natural environments for the fugitive media, with cold storage of reference samples indicating a protective effect. Collection items did not show the same definitive trend, probably since they had already undergone a combination of light, dark and natural aging. This research has positive implications for modern collections of fugitive media coming into heritage institution collections, since early intervention and storage in cool and cold environments will retard media fading, color change and loss.

### **Minimally Invasive Sampling for the Analysis of Proteins from Solids and Surfaces**

*Daniel Kirby*

Proteins from a variety of sources, such as egg, milk, hide and fish, are ubiquitous components of artworks and cultural objects. It has long been recognized that detecting the presence of and determining the nature of proteins is an important part of conservation. Knowing the materials used gives important insights into the choices and intentions of the artist; knowing the materials can aid in determining authenticity and guide future generations in understanding and accurately recreating the culture of their ancestors; knowing the materials is essential toward directing

conservation, storage and display.

Historically, the detection and identification of proteins in artworks has been accomplished by a variety of methods including amino acid analysis (AAA), FTIR, Raman, immunological methods (ELISA), GC, GCMS, PyGC, and HPLC. Each method has its strengths and weaknesses. For example, FTIR and Raman may be the least invasive methods but in most cases can offer little more than verification of the presence of protein and perhaps broadly classify its origin. AAA requires relatively large samples but can determine protein presence and generally discriminate among broad classes of proteins found in artworks. ELISA offers high sensitivity and small sample requirements but can suffer from the lack of relevant antibodies. The relatively recent migration of LCMSMS and PMF into the conservation laboratory offers enhanced sensitivity and specificity and significantly advances the conservator's ability to identify proteins with high sensitivity and specificity.

Despite increased levels of sensitivity of newer methods, protein determination still requires that samples be taken from the object for analysis. Although some artworks offer acceptable "sampling opportunities," such as paint on a folded canvas edge or areas of prior damage, in many cases such opportunities are absent, and the conservator must decide whether the potential gain in information outweighs the need to alter the object or painting, however slightly. This presentation will discuss two minimally invasive methods developed for sampling solids and surfaces to obtain material sufficient for subsequent protein analysis by PMF or LCMSMS. The first method, the use of 2–3 mm<sup>3</sup> polymer eraser cubes, is an extension of the method (triboelectric extraction) described by Fiddymet, et al.<sup>1</sup> for noninvasive sampling of velum. This adaption of that method is best suited for sampling friable surfaces and coatings thereon, where minute amounts of surface and/or coating material can be abraded loose and adhered electrostatically to the cube. The second method utilizes polishing films of fine alumina or diamond particles and is best suited for hard surfaces, such as ivory, bone, paint and photographs, which might not be sufficiently abraded by the eraser. Although technically invasive, both methods offer an option for obtaining samples with nearly unnoticeable effect on the surface. In each case, the sampling device, eraser cube or polishing film, is placed directly into the digestion buffer for subsequent enzymatic cleavage for protein analysis by PMF or LCMSMS. Examples of the use of both methods will be shown for analyzing samples from parchment, ivory, bone, hide, photo prints and painted surfaces.

1. [www.pnas.org/cgi/doi/10.1073/pnas.1512264112](http://www.pnas.org/cgi/doi/10.1073/pnas.1512264112)

## Conservation Science in Early Twentieth Century India: Dr. S. Paramasivan and the Chemical Conservation Laboratory at the Madras Government Museum

*Sanchita Balachandran*

Nearly a century after conservation science laboratories developed in museums in Berlin, London, Paris, Cambridge and New York, a 2015 special supplement of *Studies in Conservation* (SIC) sought to clarify the professional and scholarly commitments of the field of

conservation science, and to re-define the competencies and role of the conservation scientist in the twenty first century. Of new import in 2015 was the need for the practice of conservation scientists to be interdisciplinary, community-engaged, and strategic. This paper reclaims the place of a pioneer of conservation science, Dr. Subramahnya Paramasivan (1903-1987), who as the first "archaeological chemist" at the Chemical Conservation Laboratory (CCL) at the Madras Government Museum (MGM), India, forged a new path in the study and preservation of Indian cultural heritage that remains relevant and revolutionary, and in keeping with the aspirations of the 2015 SIC publication.

At the helm of the CCL from 1930 to 1946, Paramasivan's tenure was marked by a desire for understanding the physical and chemical factors that affect an object's condition and long-term preservation in a holistic way; a dogged pursuit of treatments best suited to the particular conditions not only of the objects in his care, but also the cultural and social context in which he worked; and an insistence on collaborative and interdisciplinary research to best understand a collection's preservation needs as well as its scholarly interpretation. Also significant was Paramasivan's scholarly engagement with scientists working in the field, in particular his correspondence and exchange of ideas and techniques with Rutherford Gettens. Drawing on archival documents, publications, oral histories and an extended residency at the site of the current CCL, this paper sheds light on Paramasivan's ability to negotiate and integrate scientific, cultural, political and religious demands in the preservation of museum objects. The paper further broadens the narrative of the history of conservation science, providing new evidence for the approaches of early scholars working in the field beyond Europe and North America.

## Stability of Polyvinyl Butyral Polymers with Light Exposure

*David Thomas, Blythe McCarthy, Ellen Chase, Matthew Clarke*

The need to consolidate a painted gypsum plaster surface on a Kizil wall painting fragment presented distinct challenges. The gypsum finishing layer on a mud and straw support is matte in appearance, and had been previously consolidated with a non-aqueous hydrophobic material. This earlier treatment resulted in the inability to use an aqueous material such as funori, and spurred a search for alternate solvent-based consolidants. Polyvinyl butyral polymers (PVBs), often used on many organic materials and as a consolidant for archaeological wood and bone, were recommended as a possible alternative, however, there were concerns regarding the long-term ageing and stability of the material. As a result, a research project was undertaken to build on the previous work by Feller and others.

Cast films of Butvar B-76, Butvar B-98, Mowital B30H and Acryloid B-72 (the widely used acrylic copolymer) were investigated before, during and after exposure to ultraviolet light. Additional samples underwent accelerated aging in a Weatherometer that simulated indirect daylight filtered through pane glass. Property changes were assessed using fiber optic Fourier Transform Infrared spectroscopy (FTIR), color measurements,

solubility tests and visual examination. UV and simulated daylight samples exhibited similar changes. PVB samples yellowed slightly with exposure, showed an increase in oxidation concurrent with film weight loss, and remained removable with ethanol suggesting lack of cross-linking. The degradation rate depended on the particular PVB formulation, though the exact cause was not determined. To test the effectiveness of the materials in a situation more analogous to the wall paintings that initiated the project, samples of plaster were consolidated with each of the resins being studied. These also were exposed to UV light and measurements were carried out similarly to those on the films. Due to penetration into the plaster and shielding effects of this material, discoloration was not observed after UV exposure and the films remain readily removable by mild organic solvents such as ethanol.

### Understanding the Reactivity and the Dynamics of Lead Soaps in Oil Paintings

*Jaclyn Catalano, Anna Murphy, Yao Yao, Nicholas Zumbulyadis, Silvia A. Centeno, Cecil Dybowski*

To understand the mechanisms and factors that trigger soap formation and the dynamics of the reactive compounds in oil paintings, we used advanced solid state nuclear magnetic resonance (ssNMR) and X-ray techniques, complemented by FTIR spectroscopy. We explored soap formation in model paint films at different relative humidity conditions by  $^{13}\text{C}$  NMR and studied the dynamics and mobility of relevant fatty acids and soaps, namely palmitic acid and lead palmitate, in a linseed oil matrix at different temperatures (T) by  $^2\text{H}$  NMR. The results show the extent of mobility of palmitic acid and lead palmitate in the paint matrix, how they differ, and how they depend on T. Examination with techniques such as solid-state  $^{207}\text{Pb}$ ,  $^{119}\text{Sn}$ , and  $^{13}\text{C}$  NMR, and X-ray diffraction provided the basis for interpreting dynamics in terms of the effects of structure and lead ion coordination environments<sup>[1-5]</sup>. The ssNMR results obtained in model paint samples directly correlate with features of the IR data, so they are useful to further interpret FTIR spectra acquired in microsamples removed from works of art. Also, the ssNMR data sets the basis for minimally invasive NMR studies in microsamples with the development of dynamic nuclear polarization (DNP) techniques. The results will be discussed in the context of their implications for the conservation and preservation of the works of art affected by lead soap formation.

1. Catalano, J. et al. *Appl. Spectrosc.* 2014, 68, 280-287.
2. Catalano, J. et al. *Materials Issues in Art and Archaeology X*; Vandiver, P., Li, W., Sciau, P., Maines, C., Eds.; Materials Research Society: Warrendale, Pennsylvania, 2014.
3. Catalano, J. et al. *J. Phys. Chem. A* 2014, 118, 7952-7958.
4. Catalano, J. et al. *Materials Science and Technology Conference Proceedings*, Pittsburgh, PA, USA, 2014, 2161-2168.
5. Catalano, J. et al. *J. Chem. Soc. Dalton Trans.* 2015, 44, 2340-2347.

### Revealing the Text and Folds in 17th-century Locked Letters

*Dr. David Mills, Dr. Graham Davis, Jana Dambrogio*

The international and interdisciplinary team of researchers on the Signed, Sealed, & Undelivered Project recently rediscovered early modern letters including 600 that were never opened. The team is collaborating with the Queen Mary, University of London's Institute of Dentistry to apply their Computed Microtomography (CT Scanning) imaging technology to capture complex folding patterns and textual information hidden away without physically tearing open the letters. The project explores a 17th-century trunk held by the Museum voor Communicatie in The Hague. The trunk is filled with an extraordinary archive: 2,600 letters, which were never delivered. The trunk's contents remained virtually untouched by historians until recently rediscovered. They show history preserved at the time of the "Glorious Revolution," capturing voices which might have never have been heard otherwise. The letters are examples of a technique called "letterlocking" — folding and securing an epistolary writing substrate to function as its own envelope.

Part of the effort of the team includes preserving, imaging, transcribing, and identifying letterlocking formats to reveal the chest's secrets for the first time. Micro Computed Microtomography (XMT)[Elliott 1982] is an established technique for the non-invasive, non-destructive 3-D imaging. It is gaining traction in the conservation world for imaging items to gauge their level of damage prior to conservation work, or digitizing objects too fragile to be handled. The high spatial and contrast resolution of the XMT scanners developed at QMUL allows the direct imaging of inks [Mills 2014] and hence, writing inside the Brienne letters. The 3-D volumetric data produced by the scanners also allows investigation of the letterlocking techniques employed by each letter. We present initial results from the first batch of ten letters scanned in 2016.

Elliott, J. C. and Dover, S. D. (1982), X-ray microtomography. *Journal of Microscopy*, 126: 211–213. doi:10.1111/j.1365-2818.1982.tb00376.x

Mills D, Curtis A, Davis G.R, Rosin P. (2014) Apocalypso - Revealing the Bressingham Roll, *Journal of Paper Conservation*, Vol 15 (2014), no 3, p 14-19

### Evaluation of Reflectance Transformation Imaging (RTI) Suitability for Studying the Surface Morphology from the collections of the Grand Egyptian Museum

*Islam Abd el Maksoud Shaheen*

Reflectance transformation imaging (RTI) is a computational photographic method that captures a subject's surface shape and colour and enables the interactive re-lighting of the subject from any direction. This photographic method provides detailed images of an object's shape, colour attributes and surface texture along with illumination from different angles, showing details that are often unavailable with the naked eye. Also, RTI provides information on the physical changes in the object itself as it reports on surface geometry.

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A variety of ancient Egyptian collections in the Grand Egyptian Museum-Conservation center GEM-CC are being presented in a new and informative light through RTI. Indeed, using quantitative (RTI) we obtain detailed information on the geometry and morphology of variety ancient Egyptian materials, due to the different nature of the surfaces of the materials, such as animal's skin, papyri textiles, pigments, gilded layers and wooden layer. This study focuses on different reflective properties of these surfaces from shapes and texture. Furthermore, RTI also proved highly effective for detailed documentation of variety ancient Egyptian collections before and after treatments, helping to assess many subtle changes on pictorial layers and supports caused by conservation processes. RTI technique were applied on two objects from Tutankhamen's collections, the shields and loincloths; Cartonnage mummy trappings (late period); papyrus Boulaq 22; coffin lid (21st dynasty); and wooden statuette (26th dynasty) for a better understanding of both plain and polychrome surfaces, identifying topology of layers. It provides a lot of information that helps conservators along with curators in dating, iconography throughout the insights of RTI application. The real power of this technique is the interactive RTI Viewer tool which allows the subject to be re-lighted from any direction. Different rendering modes can help bring out certain surface details such as incised designs or impressions. Finally, this method has been compared with those obtained by others standard imaging technique.

## **With Room to Grow: Design and construction of a new conservation facility at the University of Washington Libraries**

*Justin P. Johnson*

The University of Washington Libraries in Seattle, WA, completed construction of a new conservation facility in February 2016. This paper will cover the many challenges encountered as well as the many innovative and practical solutions developed by Libraries staff in collaboration with UW Capital Projects staff, architects and contractors. The new 4,000 sq. ft. facility was built, in part, to support a new endowed conservator position funded in part by an Andrew W. Mellon award. The current lab lacked both the space and the required equipment to support the new position. Previously, three staff members and as many as three students worked together in a 2,000 sq. ft. basement with limited support for complex treatment to meet the Libraries' conservation needs. The new lab would need to incorporate both the current staff, the new conservator, and allow for future capacity and growth. With the growing diversity of collection materials, staff also designed the space to support more complex photograph and paper conservation in the future. The new design therefore had to comfortably house not only existing equipment and furniture, but also new aqueous and chemical treatment apparatus, documentation and examination equipment, and increased storage, workspace and office needs. Location was a primary challenge early in design as HVAC concerns and fume hood installation required that the facility be relocated from its existing basement location. Additionally, designing for current need as well as future capacity while only doubling available square footage required significant experimentation with workflow, storage design, and efficient space use. There were also inherent challenges in communicating the unique needs of a hybrid conservation facility and its staff to architects, facilities staff, laboratory consultants and other stakeholders and collaborators throughout the project. The results of this three-year project will be presented along with discussion of the many communication solutions staff created to address design and fundraising needs. Designing the space for future flexibility and practical material storage, innovative fume-hood design, original designs for laboratory furniture, and sustainable management practices will all be covered. Now fully operational, post-construction project insights and performance will also be shared.

## **'What Do You Mean Telecom Servers and Preservation Don't Mix?' – Sustainable Preservation Environments and the Building of an Environmental Team**

*Liz Dube, Jeremy Linden*

Between 2014 and 2016, the University of Notre Dame Libraries completed a National Endowment for the Humanities Sustaining Cultural Heritage Collections Planning Grant to improve and make more sustainable the preservation environment for the University's Rare Book and Special Collections (RBSC) storage

area in the basement of Hesburgh Library. Working with an Environmental Team consisting of members from the Hesburgh Library's RBSC, Facilities, and Preservation Department Staffs, the campus Utilities Department, the Office of Sustainability, and the Facilities Design and Operations Department, as well as consultants from the Image Permanence Institute, the University was able to diagnose the cause of sub-optimal preservation conditions, as well as identify opportunities for improved preservation and reduced energy consumption.

This talk will briefly describe how the team used documentation and environmental data analysis to better understand the air-handling system for the Rare Book and Special Collections department on the basement and first floors of the Library. In addition to the challenge of managing a preservation environment in the basement and an appropriate work/research environment on the first floor, the team discovered that, as the basement level had been renovated, additional spaces had been added to the RBSC air handler – without the knowledge of RBSC or Preservation. Speakers will describe the solutions implemented to alleviate initial preservation and energy concerns, as well as future plans to maintain a sustainable preservation environment for rare and special collections.

Finally, equally as important as the preservation activities, the talk will discuss the difficulties and opportunities presented by working with an interdisciplinary team, from initial relationships and reactions, to the growth in communications and trust, to the present, where preservation advocacy is embraced by the entire team in their variety of roles. The success in building relationships has been so significant, that, to quote one team member – "Honestly, I don't recognize the context I'm working in as far as all of this goes." It is our hope that this case study will help to change the playing field – so to speak – for other institutions as it as for Notre Dame.

## **Neurons to the Task: How to balance resources with ingenuity in innovation**

*Christine Perrier*

Innovation is the introduction of something new. It is usually referred to as a new method, or device; a novelty. In conservation and restoration, we often link innovation with science and technology. However, this definition may not always be the appropriate one for many conservators around the globe. Innovation often means managing to find the safest approach to an ideal concept within a very tight budget. Concessions are part of daily decisions and it is a great challenge to be faithful to conservation standards. As a Canadian living and working in South America, I came to realize that, although money brings new dimensions to innovation, ingenuity and versatility are essential key factors to conservation. At the Archaeology Laboratory of the National Centre for Conservation and Restoration (CNCR) in Chile, juggling with cost, restrictions, and quality is commonplace. The Centre is government funded. Budget varies from year to year (mainly based on annual growth and inflation). It is not a large sum so great ideas have to come at low cost and priorities have to be made. In addition, the CNCR fixes the guidelines for public

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institutions nationwide where economical and human resources are very limited. This means it is imperative to think in terms of accessibility, reproducibility, and very reasonable cost when proposing a methodology or a design. So, imagination, resourcefulness and reflection must be present in all levels of decisions.

Part of creating something better is to change the way we look at things or address a problem. Quantities of pre-Columbian textile fragmentary have accumulated in storage rooms of national institutions for decades. Safer conditions for their manipulation were implemented by means of a simple support. It could finally give access to invaluable information that can be used in future investigations. Homemade components always add a plus to the balance: budgets can be expanded and possibilities widen. Here are a few examples of ingenuity that benefitted from recycling material, converting equipment (so it can do the desired task) or using simple material to create what was needed:

- natural fabric is dyed and sewn to make soft tridimensional supports and reinforcement for intervention, storage or display
- pieces of Ethafoam are minced and recycled in sealed polyethylene bags for cushioning in the storage of pottery
- a standard vacuum cleaner is modified into a micro aspiration device fitted for removal of particles on fragile garments
- a sophisticated casing for the transport and storage of mummified bodies is made out of Ethafoam, cardboard, Tyvek muslin and a clever vent system.

Inventiveness may be a better word. Nonetheless, it emerges from the challenge of finding a way to make it work, to create something better that is efficient and respectful in terms of conservation and budget. And it is reality.

*Students for Sustainability in Conservation Caitlin Southwick*

Sustainability in conservation is an emerging area of concern and importance. The main focus has been on larger scale issues, such as climate control in museums, packaging/shipping, storage and lighting. Conservators individually should also be aware of smaller scale initiatives to be more green in daily practice. In order to enhance the role of sustainability in everyday conservation, it is necessary to begin incorporating eco-friendly practices into education and training programs. Doing so ensures that future generations of conservators think sustainably.

In order to promote sustainability at the student level, I have started an initiative to bring the international community of students together and show how they can make a difference. SSiC, Students for Sustainability in Conservation, is an international platform for students, educators and professionals in the field to come together and share their ideas, questions and innovations regarding sustainability in conservation. SSiC presents initiatives that are easy to implement in any lab or studio, and also provides the opportunity for individuals to share their projects. SSiC promotes the concept that little changes make a huge difference. By spreading awareness, SSiC hopes to inspire the conservators of the future to a more sustainable direction. SSiC highlights key areas in which conservators can reduce waste and become more sustainable, and particularly how students can become involved and impact the future of conservation. SSiC showcases initiatives

that are easy to implement in any studio.

The RightCycle Program is one such program, which is currently undergoing a trial run at the University of Amsterdam and the Rijksmuseum Amsterdam. The use of disposable gloves is a huge source of waste in conservation. Gloves are a major contributor to landfill waste and pollution from incineration. The RightCycle program can help reduce the amount of waste produced from using disposable gloves. RightCycle is a recycling program for non-hazardous disposable nitrile gloves and is easy to implement and use. RightCycle is a propriety program from Kimberly-Clark Professional. Disposable nitrile gloves cannot be recycled through normal plastic recycling due to their composition. The newly developed program breaks down used gloves into powder using cryogenic processes to make new eco-friendly consumer products, such as patio furniture but also construction material like panels. The program is simple to use: after the gloves are used they are simply disposed of into the recycling box instead of the trash can. When the box is full, the gloves are picked up. The one stipulation for the program is that only Kimberly-Clark Professional gloves are eligible for recycling. Kimberly-Clark Professional offers a range of high quality gloves under the KIMTECH brand for the program that meet the various standards and needs of the conservator. Programs like RightCycle are easy ways for conservation labs to become more sustainable. SSiC provides awareness about these kinds of programs and initiatives and information about how to set them up in your studio. The aim is to promote an international, unified effort to bring sustainability to the foreground.

### **Fast, Cheap, and Sustainable: 3-D printing exhibition book cradles**

*Fletcher Durant, Sara Gonzalez, and Lourdes Santamaria-Wheeler*

3-D printers and Makerspaces are a growing presence in libraries. While frequently marketed as a service to students and community members, 3-D printers [also referred to as Rapid Prototyping (RP) or FFF (Fused Filament Fabrication)] can be used by conservators and exhibition designers to produce affordable custom book mounts from stable, recyclable polymers. The University of Florida's Smathers Libraries are experimenting with printing custom mounts for temporary exhibitions. Rather than purchasing generic, expensive plexi mounts, they are designed in-house, using freely available Computer-Aided Design and Drawing (CAD) software to fit unique openings of selected volumes. The mounts are printed in house on one of the Libraries' FFF printers using commercially available polymers.

This presentation will explore the Smathers Libraries' process for designing mounts, selecting polymers, printing process, and cost analysis, from the point of view of the conservator, exhibit designer, and university librarian. The presenters will also discuss issues with and limitations to the current procedures, including the possibility of recycling the mounts following exhibition into reusable filament.

## **You Say You Want a Revolution? An innovative, low-tack adhesive treatment for 18th-century silk flags**

*Camille Myers Breeze*

Flags and banners are our most patriotic national textiles. Often made of silk or thin wool bunting, they can be extremely fragile and require advanced conservation techniques for their preservation. Eighteenth-century flags—scant few of which exist in the United States—present their own set of considerations. Revolutionary War-era flags are frequently painted and over-painted with oil-based, distemper, or other water-based paint that may have physically or chemically compromised the ground silk and resulted in flaking paint or loss of original material. American Revolutionary War-era silk flags can be remarkably sound compared to 19th-century silk flags; however, they are frequently distorted and dished from use and display, presenting challenges for mounting.

Due to these and other condition issues, conservators at Museum Textile Services have endeavored to find new techniques for safely stabilizing and mounting 18th-century silk flags. Our latest method is reversible, requires minimal handling and flipping of the flag, is successful with or without a sheer overlay, and is more time efficient. This presentation will illustrate this innovation with two c 1780 flags conserved in 2016, the Third Connecticut flag belonging to the New York Historical Society, and the Bucks of America flag belonging to the Massachusetts Historical Society and now on exhibit at the National Museum of African American History and Culture. Pros and cons of this technique compared to other conventional methods of lining and mounting flags and banners will be discussed. Applications of this revolutionary labor- and resource-saving treatment to the conservation of other textiles will also be clearly illustrated.

## **Identification of Skins in a Dance Garment from Malawi using DNA Sequencing**

*Anne Peranteau, Lara Shepherd*

In recent years, the study of material culture has increasingly included techniques based on DNA sequencing. Information gleaned from the analysis of historic or ancient DNA (hDNA, aDNA) can be used to identify species used in the construction of an object, and in some cases, their geographic region of origin. The polymerase chain reaction (PCR) technique enables DNA sequences to be obtained from extremely small samples of biological materials. Like traditional microscopic examination methods, identification using DNA depends upon the availability of samples for comparison. However, online searchable databases, such as GenBank, contain many millions of DNA sequences from hundreds of thousands of organisms and continue to grow exponentially as new sequences are added.

This paper briefly reviews the development of aDNA research using museum collections in New Zealand and describes the identification of mammal species used in the construction of an African dance garment. The garment is thought to date from

the 19th or early 20th century and was collected in Malawi and donated to the National Museum of New Zealand in the 1930s. Records describing the garment as being made of monkey tails conflicted with the appearance of the garment, which was marked by a diversity of fur patterning and colouration. As a garment used for dance and also handled by museum staff over the years, DNA contamination from several sources presented a challenge to properly identifying the mammalian species of interest. We describe aspects of the method developed to overcome this problem and discuss the results obtained, which indicated that at least six species were used in making the object. Ethical issues inherent in this type of research, sampling considerations and methods will be discussed.

## **The Characterization of ‘Foxing’ on Textiles**

*Sophia Zweifel*

“Foxing,” a term used by paper conservators to describe yellow to brown spotted staining, has long been researched and debated in paper conservation literature and has been attributed to both fungal and metal contaminants in paper. While a visually similar phenomenon is frequently observed on textiles, and the term “foxing” has been taken up by textile conservators, it has not as of yet been sufficiently characterized in a textile context.

Using survey data gathered from textile conservators around the world, this project first investigates how frequently “foxing” is observed in textile collections to determine the magnitude of the problem, and seeks to identify any common factors, properties, and conditions that can be associated with the phenomenon in a textile context. While the plenitude of paper conservation research is a tremendous resource for textile conservators, it remains to be determined what correlations can and cannot be made between “foxing” on paper and “foxing” on textiles.

Rather than endeavor to identify overall causes of “foxing” on textiles, the second part of this project explores different characterization methods that offer a better understanding of the active conservation issues present on affected textiles. Techniques often used in the characterization of “foxing” include UV fluorescence photography and X-ray fluorescence (XRF) spectrometry. Using a case study of a “foxed” textile from the Canadian Conservation Institute study collection, this project compares these established methods to more accessible, affordable, and targeted characterization techniques such as bathophenanthroline strip testing for active iron ions, pH testing, and ATP/AMP bioluminescence testing for the presence of microbiological activity. In shifting the focus from characterization techniques that attempt to identify cause towards those that assess active risk, the paper discusses methods of examination that should promote the development of simplified treatment strategies that target the specific stabilization needs of the textile in addition to those that tackle the aesthetic reduction of stains.

## Oh, Bother: The conservation of Winnie the Pooh and friends

*Alison Castaneda*

This paper will describe the conservation of the five original Winnie-the-Pooh stuffed animals, namely Pooh, Kanga, Eeyore, Tigger, and Piglet, upon which A. A. Milne's classic children's stories are based. The stuffed animals were purchased by Milne at various points in the 1920s as gifts for his son, Christopher Robin Milne. In 1956, Milne donated the animals to his U.S. publisher, E.P. Dutton & Co., where they remained until 1987, when they were donated to the New York Public Library.

Although they underwent a conservation campaign when first acquired by the library, thirty years had taken its toll and it was decided that the animals were once again in need of conservation. After thorough examination at the library, they were sent to the Textile Conservation Workshop for treatment. The condition of the animals varied greatly, from Tigger, who was merely lopsided, to Eeyore, who required over a hundred hours of work. Aside from the 1987 conservation campaign, all of the animals had been thoroughly mended and repaired sometime before being acquired by the library. Many of these previous repairs, involving patching and darning, had faded to colors drastically different from the original plush. Brown Piglet now had a sage green blotch over 3/4 of his head, and gray Kanga and Eeyore were covered with numerous beige spots.

The library feared that this made the animals appear uncared for, and distracted from their historical and illustrative importance. However, it was unclear when exactly these repairs had been made. Were they undertaken in the Milne household because Christopher Robin had loved them too dearly? Or had they been added while under the care of the publisher, who may have thought they were looking shabby after many rounds of traveling tours?

A photo from the 1950s indicated that at least some of the patches on Eeyore had been added after this date, but the rest were dated largely on speculation, informed by quality of repair and materials used. Although much of the charm of children's stuffed animals comes from the generations of hand-sewn patches, a large part of these animals' importance is their resemblance to the original illustrations. Therefore, it was ultimately decided that where they could not be mediated with overlays, all truly disfiguring patches would be removed and replaced, whether or not they were believed to have been added by the Milnes. Custom mounts, designed in conjunction with a fabricator, helped to mediate defects in posture while offering inconspicuous support. The end result was animals that more closely resembled those immortalized in Milne's classic books, making the connection between literary and object history more accessible to children and adults alike.

## Making the Mold: A use for Fosshape in upholstery conservation

*Kirsten Schoonmaker, Abby Zoldowski*

This paper describes an inventive technique to create replacement chair back upholstery using Fosshape. Fosshape, a non-woven polyester that can be manipulated into rigid three-dimensional shapes with the application of heat, has been gaining in popularity for the construction of custom mannequins, but the treatment of a suite of Hepplewhite-style furniture, c. 1790, from Schuyler Mansion State Historic Site prompted investigation into the material's potential in upholstery conservation.

This suite, consisting of eight upholstered shield-back armchairs and coordinating sofa, has been on view in the "best parlor" of Schuyler Mansion since the house was opened to the public in 1917. In preparation for the upcoming centennial anniversary, a full treatment of the furniture was desired as the show cover and upholstery profiles were incorrect.

Challenged by the compound curves of the frame and the need for two conservators to create eight consistent and correct replacement backs, a method for casting Fosshape over a custom mold was developed. The resulting lightweight and self-contained upholstery cake can be minimally attached to the frame and easily removed. This paper will review the development of the technique, evaluate the success of the method, and offer considerations for future applications of Fosshape in upholstery conservation.

## From the Top Down: Dressing the historic bed—developing mounting systems from a 21st-century conservation perspective

*Deirdre Windsor*

This paper describes custom mounting systems created for historic bed hangings belonging to two New England institutions: the Woodlawn Museum, Ellsworth, Maine, and Old York Historical Society, York, Maine. Each institution had a primary goal to safely display recently conserved bed hangings within an institutional context—one in a historic house setting and the other in a modern gallery setting.

The 1827 "Best Bed" at the Woodlawn Museum's Black House features an original bedstead with dimity and silk-fringe-trimmed hangings, displayed in the bedroom for which they were made. Because the bed hangings remained relatively untouched for 200 years prior to this conservation campaign, they offer scholars rare insight into the original methods of tacking hangings onto lathe and posts. In contrast, Old York's famous wool and linen crewel-embroidered bed hangings worked by Mary Swett Bulman between 1735 and 1745, have been removed from their historic setting and are no longer associated with the original bedstead. The textiles have been on and off display in a museum setting since 1908, using various hanging methods, including tacking, applied Velcro, and a modern looping system. The two case studies compare the criteria that guided curators in making their decisions regarding the conservation and dressing of each bed.

## TEXTILES

The paper focuses on the relative technical concepts, auxiliary materials and hands-on procedures that evolved during the process of preparing these two rare and intact full sets of bed hangings for display. Preserving the current condition of each set by meeting strict requirements for vertical support and environmental protection was paramount during the conservation process. Conservation treatment applications are described as related to long-term display. In both projects, methods of supporting and securing the hangings were developed using a combination of magnetic and supportive stitched extensions, as well as some full fabric supports. Each project offered specific structural challenges relative to the bedstead and lathe supports. The primary mandate for the Woodlawn bed was to preserve evidence of all previous tacking campaigns by developing a mounting system to secure the textiles on an auxiliary frame support without intervention or mechanical fastening onto the original structure. The Old York project allowed a variation on the original mounting design using fabric and magnetic supports that were incorporated onto a modern bedstead, produced based on a period prototype. One critical criterion that guided the use of a magnetic mounting system was its flexibility to allow quick removal of the bed hangings in the case of an emergency.

Each case study describes techniques used to achieve an effortless upholstered appearance of each set with minimal intervention and simplicity of assembly. From the perspective of the conservator, the mounting system design offers ease of handling for the dressing and undressing of the beds. Both projects offered unique opportunities to initiate a contemporary methodology for mounting historic bed hangings, with results that synchronized both conservation and curatorial goals.

### Costume Loans: Challenges and strategies

*Cassandra Gero*

When requesting a loan of costume objects for an exhibition, institutions unfamiliar with exhibiting garments and accessories may underestimate the amount of time and work involved in preparing and installing these types of objects. Imagine a courier arrives at your institution with a costume ensemble for your exhibition, and the mannequin you've provided is too big around the waist. Or there's no head for the hat, and wait—this ensemble doesn't come with shoes?! Now imagine you are that courier, and on a tight deadline to install. Mounting a costume on a mannequin is much different than hanging a painting on a wall. But, with careful planning and preparation on the part of both the lender and borrower, a successful loan of costume is possible. This paper will offer strategies for lenders and borrowers to avoid potential costume loan pitfalls related to packing, mounting, installation, and display.

Exhibiting costume has its own set of unique challenges and requirements, and this paper will detail those challenges and provide strategies for dealing with each one. Methods for packing garments for travel will be discussed, as well as standard display requirements for costume. Choosing a suitable mannequin or dress form will be addressed, keeping in mind not only the size

of the garment but also the appropriate body shape for the time period. Accessories, both as museum objects themselves, as well as props to complete a total look, will also be discussed. The goal is to not only keep the objects safe during travel, installation, and display, but also to ensure the proper appearance of the ensemble. Of course, all of this takes time; this paper will aim to help in estimating the time required for preparing costumes for travel and exhibition.

Examples of courier experiences at costume loan installations will provide insight into the types of issues that can arise. While much of museum loan arrangements are handled by registrars and curatorial staff, it's important that conservators and installers are included in loan discussions from the beginning, and participate in the decision making process. With so many variables, lending and borrowing costume often requires problem solving, as no two loans are the same. This paper will provide a set of guidelines to serve as a starting point for institutions without much experience in borrowing or lending costume for exhibition.

### Learning from Treatments That Did Not Go as Planned

*Suzan Meijer, Marjolein Koek*

This paper will focus on an 1860s silk dress, which is in the costume collection of the Rijksmuseum Amsterdam. This dress is made from a unique moiré fabric, and still has its original construction, which is rare because costumes were often altered. The dress has features typical of the period: a wide oval-shaped skirt with a flat front and flared sleeves. The skirt would have been supported by a crinoline cage. The dress was selected for a publication featuring about a hundred of the most interesting costumes in the Rijksmuseum collection. This meant the dress needed to be photographed on a mannequin to show the appropriate silhouette. Even with minimal handling, strain on the material cannot be avoided during the process of mounting the costume onto a mannequin. To be handled and mounted, interventive conservation was needed in order to stabilize the dress.

In 2012, possible treatment plans were discussed by the curator and the textile conservation team. Unfortunately, during treatment it was found that the silk moiré and the threads used to stitch the different parts together were more fragile than anticipated, which made the handling of the dress especially challenging. During handling and attaching the support to the object some strain on the seams was inevitable. This caused slits in certain areas and some pleats became detached. This, in addition to a change of plans concerning the publication, was the reason that the treatment remained unfinished.

In 2016, the treatment was continued by a different conservator. When re-evaluating the treatment, different questions arose. The main question was whether the negative side-effects of the treatment could have been prevented. If not, what were the consequences for the state of the object? This paper will illustrate the difficulties of dealing with a treatment that did not go as planned. In general, we often only have the opportunity to learn from successful conservation experiences, but how can we

learn from treatments that were not successful? Additionally, the complications associated with two conservators working subsequently on the same object in a relatively short time frame, as well as the considerations of re- or undoing previous treatments will be discussed. The silk moiré dress is a valuable case study for illustrating and discussing both practical and ethical solutions.

### **A Worthwhile Endeavor: The conservation of a Worth and Bobergh ensemble**

*Johanna Tower*

During a time when clothing was a costly commodity, restyling, resizing, and re-purposing garments to accommodate changing fashions and bodies were common practices. Such well-worn items of dress are a common feature of museum collections and pose a number of treatment challenges to the conservators who care for them. A circa 1870 Worth and Bobergh ensemble in the collection of the Museum of Fine Arts Boston is a prime example: the evening/day bodices and skirt had each undergone multiple generations of alterations by the time the ensemble was acquired by the museum in 2002.

Over the course of a year-long Mellon Fellowship in the MFA's Textile Conservation Lab, the author undertook extensive conservation of this ensemble in preparation for its inclusion in a 2017 touring exhibition entitled *La Parisienne*. The ensemble's silk faille fabric suffered from numerous condition issues requiring myriad conservation treatments, the successes and challenges of which will be discussed in this presentation. Losses necessitated custom-dyed materials to compensate for parts of the skirt that had been cut away. Two different dyeing procedures were used to approximate the early synthetic purple of the garments' primary fabric and the off-white tint of the contrasting patterned fabric. A large stain on the front of the skirt in a section of the patterned fabric further involved generating a digitally printed reproduction of the pattern to mask the stain for exhibition. Heavy creasing throughout the fabric and trimmings required multiple humidification treatments using both water vapor and steam. Splits and tears in weakened areas of ruffle and lace trimmings had to be stabilized with both stitch- and adhesive-based repairs.

The scope of these treatments provided the author with the opportunity to experience and compare the implementation and efficacy of different conservation techniques. In addition to the fabric damage wrought by wear and aging, changes made to the construction of the garments also had to be addressed in this treatment. Inexpertly worked alterations drastically changed the silhouette of the skirt and, by permanently joining the skirt to the evening bodice, made it impossible to dress it interchangeably with either day or evening bodice as has been originally intended. Returning the skirt closer to its original configuration involved a study of Worth and Bobergh construction methods seen in other extant examples, an in-depth analysis of evidence remaining in the skirt itself, and the construction of a half-scale mock-up based on the garment's conjectured configuration. The early alterations made to the ensemble to keep current with fashions during the transitional period of the late 1860s and early 1870s also had

to be carefully considered when determining the best approach to its treatment and display. This treatment involved a wide-ranging approach that drew from both 21st-century conservation methods and 19th-century dressmaking techniques, exemplifying the breadth of knowledge and skill that is often called upon in costume conservation.

### **A Treatment Returns Undone**

*Nancy Love*

Often treatments do not go as planned. Well thought out treatment proposals often need a small or sometimes a large change of plan as the work unfolds. We do our best and the outcome is usually successful. Completion of a treatment for conservators in private practice includes instructing the client on how to care the object, and then it's out of our hands. Occasionally, the intended treatment does not go as planned due to the actions of the object's owners. This was the case of an Onodagah/Iraqis feathered headdress I treated 17 years ago.

The ceremonial headdress was made and presented to the owner's grandfather in 1930 in honor of his friendship and service to the tribe. The headdress, a man's felt hat decorated with 28 eagle feathers and beadwork, was in poor condition. The hat was fragile and many of the feathers were detached. The headdress was covered in dust and there was extensive loss of feathers due to insect damage. The family admitted that the headdress had never been protected and confessed that it had often been worn for the carving of the turkey at Thanksgiving. The treatment included surface vacuuming, cleaning and stabilizing the beadwork, reattaching feathers to the hat and constructing a solid interior mount for support. The interior mount was also attached to a solid baseboard to help support the lower feathers. The owners picked it up and promised to protect it in an exhibit case.

In 2016, I received a referral through the University of Pennsylvania Museum about treating a ceremonial feathered headdress. It was the same headdress, and now it was in very poor condition. The hat was more fragile, and more feathers were detached. The headdress was again covered in dust and there was more loss of feathers due to insect damage. Also, part of the mount was missing. The owners were extremely embarrassed and were determined to have the headdress conserved and properly protected. A new treatment was devised to attach the feathers through the hat into a solid interior mount for stabilization. This treatment did not go as planned. The owners felt that attaching the headdress to the solid mount would make it a sculpture. They wanted the headdress to be removable from the solid mount in keeping with its original intent. Eventually a compromise was reached that satisfied both conservator and clients. The owners have built a glass front bookcase to protect the headdress. As they wisely said, "We can't do this again."

## Deconstructed: Restoring the intent and integrity of a rare Kainai squirrel-lined baby quilt

*Shirley Ellis*

Over 100 years old, a Kainai First Nation baby quilt in the Royal Alberta Museum collection was unique in the way that it was composed with a decorative quilted side and a thermal fur side for warmth. The cotton quilted side was made up of vertical bands – some continuous and some formed of patchwork squares, while the thermal side was made from a series of gopher furs (Richardson Ground squirrels) attached to a flour sack (“Cardston, Alberta” is still visible).

Over the years, the quilt suffered from major rodent and moth damage, plus overall soiling and distortion. After colourfastness testing, it was determined that it could be safely wet-cleaned but the layers needed to be separated. Not an easy decision, weighing the pros and cons, and during consultation with the curator, it was decided that the benefits of wet-cleaning outweighed the separation of the layers and possible change in reassembly. The quilt top and cloth to which the furs were attached were all separated and wet-cleaned. The fur skins were humidified and flattened then secured to a nylon tulle backing for support and unification of the skin layer allowing it to be reattached to the flour sacking. Stabilization of the textile completed the treatment, filling in the losses, allowing the visitor to view the quilt as a whole and to appreciate it for what it was. In the end the baby quilt is more stable, its appearance improved, its life span increased, making it more accessible for generations to come.

## Agarose, Two Ways: Successes and challenges in large scale gel applications

*Dana Goodin*

Agarose gels are rigid polysaccharide gels that, through capillary action, can be used as a slow, controlled cleaning method. While the gels have originally been primarily used in paper and sculpture conservation, textile conservators have recently been exploring the effectiveness of agarose gels for flat textile cleaning. It has been established that agarose gels can be the best method for cleaning if the textile requires a special chemical compound for stain removal, such as enzymes, or for stains on textiles in danger of dye bleed. Research on large-scale agarose gel applications has not yet been published.

Recently, two very different types of tapestries were brought to the textile conservation lab at the Cathedral Church of St. John the Divine that became candidates for agarose gel treatments. A set of six William Baumgarten tapestries, dated to the 1910s, were recently discovered in a privately owned Upper West Side townhouse. They had been subjected to the normal environmental fluctuations of a New York City townhouse for almost 100 years, as well as several water pipe leaks that left dark staining. The silk wefts are so desiccated that the silk is powdering and the tapestry is far too fragile for immersive wet cleaning. It was determined that using agarose gels would possibly be the safest and most effective

way of cleaning and conserving the tapestries. The second case study is a multi-colored wool Agam tapestry with a white cotton ground from the 1970s which had large amounts of a hard, yellow polymer glue in thick layers along the back top and bottom edges. The glue had been used to attach a lining and was embedded in warps and wefts of the weave. During initial testing, it was determined that the red and black yarns were not colorfast, removing the possibility of a traditional immersive wet cleaning. After significant testing, it was determined that amyl acetate was necessary for the softening and removal of the glue. However, due to the dangers associated with amyl acetate, agarose gels were used as a vehicle for the application of the amyl acetate, since the gel would allow for a targeted treatment that would reduce the amount of human contact with the amyl acetate. This paper discusses how agarose gels were used to clean two very different tapestries with very different conservation needs and the challenges and problems faced along the way.

## Sublime Applications: Creating an efficient cyclododecane barrier on textiles

*Gennifer Majors*

Dye bleed caused by wet cleaning is a common problem during conservation treatments. A protective hydrophobic barrier is sometimes created over such water-sensitive dyes using the wax-like material cyclododecane. However, little research has been done on how to create the most efficient cyclododecane barrier on textiles. Seven different application methods were devised and tested for effectiveness. Samples with water-sensitive dyes were treated with cyclododecane barriers and then soaked in water to find which of these application methods best protected against dye bleed. Gravimetric and visual analysis were used to track any changes in the applied cyclododecane. ATR-FTIR and DRIFTS infrared spectroscopy were performed to discover how well the cyclododecane had coated the samples' fibers. The resulting data revealed the most effective method to be as follows: Cyclododecane is applied to one side of a textile while the textile is at room temperature. Cyclododecane is then applied to the opposite side immediately after the textile has been heated. This heating allows the cyclododecane to become well-embedded within the textile, coating and protecting the fibers. The efficacy of the paintbrush and kistka as application tools was also investigated during the experiment. It was discovered that the brush applied more cyclododecane overall, but the kistka resulted in a more effective hydrophobic barrier. The results were used to create instructions for applying cyclododecane to textiles, which conservators can use during treatments requiring a hydrophobic barrier to protect water-sensitive dyes.

## Safely Mounting Figures with Extreme Action Poses

*Sunae Evans*

The National Museum of American History (NMAH) delivers the experiences of the American people through exhibitions utilizing various museum objects. Costumes are some of the most powerful examples of material culture and provide insights into an individual's historical background and characteristics. As a history museum, NMAH is devoted to the preservation of the museum objects for future generations, and the presentation methods available for their displays are limited by minimal handling of the objects to avoid unnecessary damage. In most exhibitions, costumes are displayed with a script and appropriate images, so the need to display costume on extreme figures has been avoided. However, some costumes definitely require action poses to get the true feeling of the action.

This presentation will explore the methods, tools, and techniques to enable the display of costumes in action poses while continuously practicing our usual preventive conservation approach. Two of the costumes in my presentation were worn by Olympic medalists Shaun White and Mike Schultz. Shaun is a skateboarder and snowboarder, and Mike rides a motocross bicycle with a prosthetic leg that he built himself. These men are extreme athletes, so the project teams' decision was to show Shaun riding a skateboard and Mike on a moto cross bicycle at stiff angles in a display case that could be only bracketed at the ceiling. In addition, we mounted a scientist's protective suit and a Spiderman costume that are completely sealed at the feet, so other areas had to be bracketed in order to support the whole body. Lastly, Phyllis Diller, an animated stand-up comedienne who often laughed loudly, is presented in her signature stance: hand on hip, a side-bending posture, and holding a cigarette. The planning and execution of mounting these costumes will be explained in detail.

## 3D Modeling and CNC Routing of Mannequins for Displaying Costume

*Brenna Cook, Brendan Gallagher, Nick Kazakoff, Carmen Li*

New developments in 3D modeling and computer aided manufacturing techniques including 3D printing have allowed for greater access to custom-created physical objects. The open-sourced nature of the technology and the inclusion of 3D printers in community settings like libraries aligns with the values of not-for-profit institutions like museums. As part of its once-in-a-generation capital renewal project, the Royal Alberta Museum is engaging with this new technology to create custom-fit mannequins for its new Human History galleries. Approximately 78 mannequins will be digitally modeled based upon measurements taken directly from the objects intended for display. The mannequins will be routed out of planks of Ethafoam and heat sealed together using no adhesives or other unsafe display materials. Key to the success of this project will be clear communication between RAM conservators and local design firm onetwosix who will form the shape of

the body between the framework of measurements taken from the object. Final fitting and covering of the mannequins will still need to be done by conservators; however, it is anticipated that the custom sizing and fit of these mannequins will result in a method for mounting costume that is more economical in staff time as well as in cost and materials. The preservation of the digital files also allows for potential dividends should these same objects be displayed in the future. The first set of test measurements have been submitted to the designers and prototyping is underway. By May 2017, the project should be nearing completion and final fitting-up underway for the majority of the mannequins.

## 3D Scanning to Create Custom Storage Forms for the Charles James Collection in the Costume Institute, Metropolitan Museum of Art

*Sarah Scaturro, Taylor Healy*

Costume Institute conservators were inspired to explore 3D scanning as a means to bypass the inefficiency and inaccuracy of hand carving storage forms for twenty-eight sculptural Charles James gowns and coats in the collection. These masterpieces—mostly strapless, form-fitting dresses with complicated structures and layers—present a challenge for storage. The gowns cannot be laid in flat storage as they will collapse and lose their structure. They cannot be hung on traditional archival hangers since the objects can weigh nearly twenty pounds, thus causing tension on vulnerable areas leading to deformation and tears. Improper storage not only subjects these pieces to unnecessary stress but compromises James' design intentions as the gowns lose the structure that James masterfully composed. Conservators realized custom body forms were necessary to create a proxy for the human body to sufficiently support these dresses in storage.

These custom forms were created by 3D scanning extant exhibition forms as well as accessioned original forms James created. An affordable, consumer-grade 3D scanner was used to successfully capture the "geometry," or surface of the forms. The 3D files were edited through a series of Computer Aided Design (CAD) programs and sent to a fabricator to cut Ethafoam from a 5-axis Computer Numerical Control (CNC) machine. The forms will be padded and covered to ensure the dress contacts an appropriately safe surface. These forms are intended to serve as the permanent support for the gowns, requiring a multipurpose design for handling, storage, travel and photography. A custom interchangeable hook attached to a pole and flange system will allow these forms to be hung or fixed on a base as needed. The advantages of 3D scanning and CNC routing include accuracy and reproducibility of a form at any point. The 3D digital files, in theory, can last forever and can be exchanged digitally. In addition to creating a suitable storage solution for the James collection, the objective was to demonstrate an efficient and effective method to storing complex objects. This technique was made possible without high-end equipment and serves as an affordable, accessible alternative to the hand-carving method that yields a rough, imperfect storage form.

## **Making Ethafoam Mannequins using a CNC Router**

*Gail Niinimaa, Nils Sundstrom*

After 35 years of building mannequins by hand using a stacked disc or cross sectional slab method, Gail Niinimaa, Niinimaa Enterprises Inc., had the opportunity in 2016 to build 20 mannequins for the new National Music Centre in Calgary, AB, within an 8-week time frame. Collaboration with Nils Sundstrom, Solid Woodwork Ltd, a Calgary company that had both the CNC router and the computer expertise, resulted in a very successful project.

Measurements taken from the actual costumes were used to create the correct body type and size for each costume going on display. Nils interpreted the 2D measurements and created the 3D files that were needed and transferred them back to the CNC cutting process. The CNC router was used to cut the 2" planks of Ethafoam 220 into 5 sections per mannequin. These sections were hot glued together with 3M low melt hot glue to create the 3D forms. Gail finished the mannequins by completing the final fitting, cutting the Ethafoam by hand where necessary, covering with fabric and adding arms and legs when needed. The use of this technology enabled the project to be completed quickly and provided a better starting point for building a safe mannequin compared to traditional mannequin making methods. Overall there was less handling of the costumes and a better fit was achieved with much less time and effort.

A variety of finishing methods were completed on the mannequins including padding with fiberfill batting, covering with jersey knit and several different solutions were used for the arms and legs including Fosshape, Ethafoam and soft sculpture. The collaboration between a Textile Conservator and an Industrial Designer helped this idea of making mannequins with the CNC router become a reality. The opportunity to work with an upcoming exhibition allowed us to develop a range of body types that would work for this project. The paper will share the details of the project and the process of using the CNC router for mannequin construction.

## Count Lamberg's Roman Table in the Rijksmuseum

*Jan Dorscheid, Arie Pappot\**

In 2016, the Rijksmuseum accessioned a unique Roman baroque table. The coat of arms of Count Leopold Joseph von Lamberg (1654–1706), the ambassador to the Court of St. Peter at the Vatican between 1700 and 1705, is virtually ceremoniously staged above a cartouche with a trophy carried by the convoluted stretcher. The table has exuberantly carved legs with a complex arrangement of overlapping C- and S-scrolls, and supports a green verde antico marble top. It is embellished with accentuating and intricate gilt-bronze mounts in place of the more commonly used raised gesso gilding. Being a unique example for its time, the table is recognizably related to designs by Filippo Passarini from the late 17th century and Carlo Fontana from the early 18th century, while the carcass with its facades of false drawer fronts appears to be more old fashioned. A late 17th century *pietre dure* silver cabinet made by Filippo Schor, Franz I and Dominikus Steinhart for Palazzo Colonna in Rome provides a further link, as it bears striking resemblances in its carving and applied mounts.

The unusual joinery of the center table very much reflects the work of a sculptor rather than a cabinet-maker, utilizing small tenons and threaded bolts for its joinery. The table is executed in deeply carved pear and is stained to imitate a darker wood. Its somewhat lopsided overall appearance originates in twisted and warped components resulting from the use of timbers for the construction that possibly were not fully seasoned. This has contributed to the overall instability of the center table.

Research into the table's gilt mounts revealed the use of a unique type of copper alloy which differs distinctly from the set alloy standard used in Paris, and which were replicated later in England and Germany. Select mounts that have gone missing seem to have been cast from the original ones.

Based on the joineries' geometrical arrangement and a systematic trial series, an optically and structurally more favorable leg-stretcher configuration could be determined. As the table remained somewhat lopsided, various possibilities such as repositioning the bolts versus a replacement with modified hardware were discussed. The implementation of several structural modifications, without compromising original substance, proved crucial to maintain the tables stability and re-establish its proud appearance and optical symmetry.

## Interpreting Thonet: Treatment of a Gebrüder Thonet bentwood rocking chair

*Paige Schmidt, Jonathan Thornton, Dr. Aaron Shugar, Dr. Rebecca Ploeger, Jiuan Jiuan Chen*

Gebrüder Thonet was an Austrian based furniture manufacturer established in the 19th century. Often credited with the invention of bentwood furniture, the company in fact developed the first mass manufacturing processes for harnessing the unique tensile properties of wood to efficiently produce affordable bentwood

furniture. While many reproducible models were originally manufactured by standard molds, missing elements of bentwood furniture can be a challenge to replicate.

This paper will focus on the treatment of a Gebrüder Thonet rocking chair and the process employed to create a reproduction of the rocking chair's missing back splat. Technical challenges faced when creating this back splat included the back splat's compound curvature and the fact that the intact joinery of the crest rail, stiles, and lower rail physically locked out the insertion of an intact replacement piece. Research determined that the chair's original back splat was constructed out of veneered ply, and a custom mold was built to form the reproduction piece out of bendable plywood and beech veneer. In addition to the missing back splat, which served as a major component of the chair's aesthetic continuity and intended function, substantial areas of the finish were stripped and the surface was sanded, leaving newly exposed bare wood visible on nearly half of the chair.

Decisions regarding the overall treatment, which were informed by the existing wear on remaining elements of the chair, will also be discussed. Given the degraded and worn appearance of the remaining finish, as well as the damage incurred through partial stripping, the owner was also interested in learning more about the possibility of the presence of original finish. Little is published on the original finishing techniques employed by the Gebrüder Thonet Company, and it was decided that an investigation of the finish on the rocking chair in comparison to the available literature may shed light on the nature of the finish and its potential originality.

## A New Tool for the Traditional Toolbox

*Alton J. Bowman*

This paper details the combining of traditional French marquetry techniques with contemporary CNC inlay methods. The project is the replacement of a lost marquetry top for a writing desk base attributed to Jean Francoise Oeben. The top chosen for reproduction was the well-known mechanical desk by Oeben at the Getty Museum. Topics discussed are ethical considerations, the relative advantages of each process, and similar works by Oeben in public collections. Also noted are sources of period veneers and substitutions for commercially extinct woods.

## Understanding Currently Accepted Practice: Wood fills and conservation material decision-making

*Megan Narvey*

The process of deciding which conservation materials to use when planning a treatment is of natural interest to conservators-in-training. However, results from a series of interviews with professional object conservators in the UK indicate that material choice in conservation is worthy of scrutiny by the profession as a whole. Wood is a material that may require conservation fills for a variety

of reasons. When it comes to choosing a wood fill material, there are many different combinations of adhesive and bulking agent that have been or could be used successfully. Many adhesives used on wood have been studied scientifically, with case studies published about their use in conservation. There are fewer studies on the use and properties of bulked adhesives. Without guidance from the literature, how do object conservators make decisions about what materials to use?

A series of interviews were conducted with object conservators from a variety of backgrounds, working at six different museums in the UK. The results of the interviews show several obstacles in conservation practice that may at times prevent conservators from achieving high standards of material decision-making. The results of this research will be discussed during this presentation, with the goal of introducing a more open dialogue about material choice in conservation practice.

### Conservation of The Immaculate Conception at San Xavier del Bac

*Matilde Rubio, Timothy L. Lewis*

The Immaculate Conception is an 18th century polychromed and gilded wooden sculpture that resides in the Main Altar of the Church San Xavier del Bac, located on the Tohono O'odham Reservation near Tucson, Arizona. It is a living church in which the O'odham people, formerly known as Papago Indians, still attend for various celebrations throughout the year. The church is considered to be arguably the most significant historic building in Arizona.

The Immaculate is represented as a young woman standing over a half moon surrounded by a cloud and three cherubs. The life-sized sculpture had been precariously standing in her niche for at least 200 years. In fact, one of the major challenges during the course of our work was to bring down the sculpture from her niche, located at a height of 19 feet from floor level, and putting her back up without causing further damage. Over the years, the different pieces of wood and the strips of canvas used for the joints have moved and expanded due to the changes in temperature and humidity. This is the cause of most of the cracks that can be seen on the surface and which led to the loss of paint and preparation layers. The face, the hands of the Immaculate and the faces of the four cherubs were overpainted, possibly at the beginning of the 20th century. The whole area of the sculpture was covered by a thick layer of dust, grime, mud daubers etc. In most of the areas the silver leaf used for the garments has sulfated dramatically and turned a rusty brown color. Over the years, other damages were caused due to neglect.

The course of conservation and restoration began in January 2016 through mid-April of the same year. Preliminary studies were done in 2015, which included chemical analysis of the paint and preparation layers, a brief research of the Immaculate history and previous documentation. Cleaning along with consolidation tests were also performed. The chemical analysis gave us the composition of the different stratigraphic components. We were able to identify the original paint layer as well as the over paints. In the

case of the carnations, the chemical analysis and the study of the surface through ultraviolet light was crucial for the identification of the repaintings which allowed for their appropriate removal. Structural consolidation includes the filling of large cracks with balsa wood and wood paste. Paint layer consolidation done by injection using natural glue, following the composition of the original material. The removal of the over paintings, mud daubers and non-original substances using the appropriate products and tools for each task. Volume filling done using traditional stucco. Inpainting was applied with water colors and conservation varnish colors (Maimeri). The technique used to distinguish the original paint layer from the intervention is called *tratteggio* (three lines crossing, of three different colors or shades). For the last phase, a natural varnish was applied as a protective layer.

### Manufacture and Treatment Study of Coffin and Mummy Cartonnage, at Egyptian Museum in Cairo

*Moamen Othman, Eman H. Zidan, Rania El Atfy, Mohammed A. Hussein, Randa El Helw, Sabah Abdel Razek*

Ancient Egyptians used various materials to make coffins; stone, ceramic and wood. They developed substrates and painting techniques to cover the surface with using different pigments and coatings. Technical studies, investigations and analysis application are important to identify materials and core elements used in the past.

This deliberate study aims to analyze a wooden coffin and mummy cartonnage presumably dated to late period. It was found during a working season in the Egyptian Museum basement storage in 2004. The only a single document that contain information about it was found in a report written by Maspero in 1901, indicating that the object entered the museum collection in 1900. It was left unregistered since then. In Maspero's report, he addressed that, it was discovered by Petrie excavating in Lahon, Fayoum. The report includes a black and white photograph shows the object by the time of discovery.

The type of the coffin and cartonnage suggests a middle Egypt type of third intermediate and late period. The broad collar, pendants, rosettes and other decorative elements suggesting belonging to the late period stylistic motifs. The central inscription, which is repeated on both the coffin and the cartonnage, represents the offering formula addressing the god Osiris. The name of the owner was demolished in both coffin and cartonnage. The coffin set includes coffin base, lid and a mummy cartonnage. The wooden coffin lid (193 cm long) is made of four wooden planks joined by wooden dowels, the wood base in the central area of the lid is covered by gesso and pigment, pigments vary; white, black, yellow, red and blue. The coffin base (193cm long, 48.5cm width and 34cm height) consists of 13 wood pieces that form the rectangular shape. Pieces are covered with mud as preparation layer and then were painted in yellow. The coffin base was dismantled into 11 pieces when it was first received in the conservation department.

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The mummy cartonnage (180cm long) features a woman, the iconography matched in both coffin lid and the mummy cartonnage. It is a mummy covered with more than 33 layers of textile then gesso and then painted in bright colors; white, black, red, yellow and blue. The wooden coffin consists multi-layers: wood, gesso layer, additives (under investigation) and painted layer. There are different pigments used in the decoration of the coffin: white background covered with blue, red, black and yellow for inscription and decorations. The state of the wood is very poor, the coffin is dismantled into many pieces (base, 2 sides and fragments), and some pieces are still joined together by wooden dowels. The head block has areas of loss, cracks, breaks and disjoints. Regarding the mummy cartonnage, the pigment and painting palette is quite similar to the one in the wooden coffin. Its state of preservation appears to be moderately stable except the lower parts that suffer some losses, cracks. The lower part (foot area) has a severe damage.

### **Preservation of the Endangered Cultural Assets of the Traditional Egyptian Storyteller's Heritage and its Instruments and Tools**

*Dr. Hany Hanna*

The traditional Egyptian storytellers' heritage is very important. In its expressive singing, stylized speech, motion and assets, it is one of the unique expressions of Egyptian's rich performing arts tradition and folk culture. It represents a repository for the rich spectrum of Egyptian folk history, symbolism and traditions not only in its intangible form but also in its instruments and movable assets. There are several forms of this heritage:

1. In its cinematic form, the storytellers, for narrating the stories accompanied by images, scenes and music, use a wooden box (called Sanduk El-Donia "Peep show box").
2. In the theatrical form, handicraft puppets (called Araquz or Qaraquz), made of wood and textile been used.
3. In its musical form, there are different storytelling performed by vocalists and poets accompanied by various musical instruments made of wood, reed and other materials (e.g. Rababa, Simsimiyya, Darbukkah and Mizmar).

The assets of the traditional Egyptian storytellers' heritage are very rich and have an irreplaceable value to our understanding of past and present cultures and they require care to preserve their value for future generations. The danger of losing such heritage and its assets is latent. It is rapidly disappearing for several reasons. A project been launched in cooperation between The UNESCO Office in Cairo, ICOM-CC-Wood, Furniture and Lacquer WG and The International Storytelling Center (ISC) Jonesborough, Tennessee, USA, during which a survey, review, inventory and assessment of the assets of traditional Egyptian storytellers' heritage been conducted in the Egyptian museums/institutions as well as some international museums/institutions.

The work includes:

1. Surveying, reviewing and assessment the existing collections in the Egyptian museums, in order to assess the representative-scope, quality and quantity of the

collections and their state of conservation.

2. Assessing the conservation problems of the mentioned assets in the Egyptian museums and proposing the required conservation process within a general detailed comprehensive conservation plan. That includes:
  - a. Evaluating the existing conservation facilities of the museums and propose their upgrading.
  - b. Conducting a full assessment of the state of conservation of the collections.
  - c. determining the conservation needs of each collection, in general, and the artifacts, in particular.
  - d. proposing a plan for upgrading the various collections in order to ensure the long-term future of the artifacts.
3. Documenting and gathering existing visual and textual documentation of the mentioned assets for digitization and storage.
4. Surveying and reviewing the existing collections in some museums/institutions in some countries as USA, India, UK and Italy.
5. Defining future development possibilities and feasibility for further phases of the project to be undertaken.
6. Writing full reports on the results include surveying, reviewing, assessment and documenting conducted, the conservation plan and a short brochure on the subject.
7. Designing a database with webpages to be related and linked to the UNESCO website for the collections, with basic information on their history, description, photographs, etc.

In this paper, the work conducted with the complete results will be summarized with some example details.

### **Wood Working Tools as Art**

*Jonathan Thornton*

For many years I have made woodworking tools in order to explore alternative and "ethnographic" methods of working wood, to teach those concepts to students in art conservation, and to create my own works of art. Initially, these tools were more strictly functional, though carefully finished and ergonomic. In time, the tools became more obviously sculptural, though the utilitarian aspect was never lost. In recent years my tools have become zoomorphic and sculpturally sinuous, using natural and found materials, and incorporating hand-forged blades. Materials include tool steel, "Damascus" steel, various types of wood, stone, glass, cordage, leather, ivory and bone.

This approach is informed by many cultures worldwide that have produced elaborately decorated tools, sometimes to the point that function can be perceived as compromised. The spiritual power of tools and their master-users in other cultures will be touched on. This paper will present a selection of my sculptural tools as well as their inspiration, including those based on the "crooked knives" of Native Americans, axes and adzes of Pacifica and the Northwest Coast of North America, bow drills of Africa, the "spear plane" of Japan, and scorps and chisels of more innovative design not obviously derived from ethnographic

prototypes. My methods of work will be described. Fine points of form following function will be detailed, as will other subtle aspects of hand tools. Use of the tools will be linked to the actual objects that were made using them.

### Technical Analysis and Conservation Treatment of a Mid-Eighteenth Century Chinese Carved Wood Lacquer Bodhisattva Sculpture

*Lisa Ackerman, Jonathan Thornton, Dr. Aaron Shugar, Dr. Rebecca Ploeger, and Jiuan-Jiuan Chen*

Asian lacquer is an ancient art form resulting in a beautiful, hard, gloss material derived from resin that comes from the sap of sumac trees in the Anacardiaceae family (Rivers and Umney 2003). These trees grow in a number of Asian geographical regions. In China this traditional lacquer is known as qi, however, the Japanese term urushi has become commonly accepted for Asian lacquers. Both qi and urushi are made from urushiol sap collected from *Toxicodendron verniciflua*. Vietnamese and Taiwanese lacquers are made from laccol sap collected from *Toxicodendron succedaneum*, and thitsiol sap from *Gluta usitata* is used in Thai and Burmese lacquers. Also depending on the country of origin, other organic materials such as drying oils, persimmon juice, blood, animal glue, wood oil, benzoin and starch are often added to the lacquer to alter working properties, appearance and cost.

Minerals and/or organic pigments are often used to add color (“Characterization of European and Asian Lacquers” 2010). Inert organic fillers such as clay or powdered ceramic are often added to thicken and provide body. Urushiol is the main monomeric component of urushi lacquer. Lacquer is applied wet and hardens when exposed to humid air. Molecules in the resin absorb oxygen and form a durable, cross-linked polymer that is impervious to water, salts, acids and alkalis and is insoluble in any solvent (Ma, Lu and Miyakoshi 2014). Often for export lacquerwares, laccol, a much less expensive lacquer, was used while reserving the more costly urushi for lacquerwares that were made to stay in China. This project involved the technical analysis and conservation treatment of a mid-18th century Chinese carved wood lacquer bodhisattva sculpture, thought to be made for a Chinese emperor, and not for export.

In order to determine the materials used, method of manufacture, confirm the country of origin, and determine a method of treatment; conservation issues were assessed, and sampling was conducted in appropriate areas of the lacquer for analysis. Examination and analyses were carried out using photographic techniques, x-radiography, optical microscopy, X-Ray Fluorescence spectroscopy (XRF), Scanning Electron Microscopy and Energy Dispersive X-ray Spectroscopy (SEM-EDS), Fourier Transform Infrared spectroscopy (FTIR), Pyrolysis–Gas Chromatography–Mass Spectrometry (Py-GC-MS). The results were then used to consider the types of materials used, the fabrication method, and possibilities of origin and quality; and to formulate a suitable plan for treatment using appropriate conservation materials and methods.

### Old Meets New: Consolidation techniques

*Elizabeth Peirce*

As Chinese export lacquer degrades, it becomes increasingly more sensitive to staining by polar solvents. This is a particular problem when trying to consolidate the lifting and cracked surfaces that frequently occur on export lacquer pieces. Choosing a consolidation material and method often becomes a difficult challenge. Proteinaceous adhesives, such as hide glue or fish glue, are more sympathetic with the binder in the ground, making retreatment in the future simpler. However, these adhesives are transported in an aqueous solution which can be damaging to the lacquer surface.

As part of my fellowship year, I was charged with treating a six-paneled screen in need of extensive consolidation. Standard consolidation techniques which had been used for the treatment of other export lacquer pieces within the collection were proven to be too damaging to the screen for two reasons. One, the screen had never been varnished, leaving the lacquer surface exposed to staining from consolidants, and two, it was highly sensitive to both water and ethanol. Synthetic adhesives, such as Lascaux MFC and Plextol B500 were tested and were deemed insufficiently strong. Additionally, because the screen was being treated as part of a collection of objects as part of an IMLS grant, consistency between interventions was highly desirable.

Three major changes to the technique were made. First, the humidification technique was abandoned; the combination of heat from warmed steel shot baggies and injected 1:1 ethanol:water created a microclimate that severely damaged the lacquer surface. Instead, Vivak, a clear acrylic used in mount making, was bent to form long, rectangular humidification chambers that removed contact of liquid solvents with the lacquer surface. Second, fish glue, with its longer open time and fluidity at room temperature, replaced the hide glue, which required frequent reheating of the needle to maintain fluidity. Last, and most important, a new consolidation technique using silicone solvents to flood the surface and protect it from excess adhesive was tried. Silicone solvents D4 and D5 had been successfully used as part of a cleaning regimen as a protective barrier for another lacquered piece in Winterthur’s collection. As a barrier for consolidation, they were found to not stain the surface, to evaporate slowly enough to allow the removal of excess adhesive safely, and to not leave any noticeable change to the surface after evaporation. This new technique has been extremely successful when applied correctly and was particularly helpful in stabilizing this particularly difficult object.

### Conservation and Analysis of a Pair of Qing Dynasty Lacquer Clothes Wardrobes in the Collection of the Philadelphia Museum of Art

*Wei Kao, Kate Duffy, Hiromi Kinoshita, Peggy Olley, Behrooz Salimnejad, Beth Price, Kelly Conlin, and Barbara Fisher*

A pair of Qing dynasty (1644-1911) lacquer clothes wardrobes (1940-7-1, 2) has long been considered a highlight of the Chinese art collection in the Philadelphia Museum of Art. The large

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wardrobes each consist of a lower and upper cabinet with gilt lacquer decoration of dragon and lotuses appropriate for furniture made for an imperial family.

In 2015, the wardrobes were selected to be a part of a special exhibition. Due to years of use as display cases, they required conservation treatment, including structural repairs and consolidation of the surfaces. The treatment was also an opportunity for a comprehensive technical study. The first wardrobe to be brought to the lab was 1940-7-2 due to the need for major structural repairs; this was the primary focus of the technical examination described below. Wardrobe 1940-7-1 was studied for comparative purposes.

Initial analysis revealed a complex stratigraphy, including an earlier decorative campaign. Examination of the structure revealed dissimilar construction techniques between the upper and lower cabinets. In order to clarify these initial findings, a battery of scientific methods was employed for the examination of the wardrobes. The methods chosen for the initial examination were: ultraviolet (UV) light examination, x-radiography, infrared reflectography

(IRR), and hand held x-ray fluorescence spectroscopy (XRF). Over forty cross-sections were taken and examined by visible and fluorescent light microscopy (VLM and FLM) revealing the decorative stratigraphy. Several of the multi-layered cross-sections were then exhaustively separated into discrete layers which were then analyzed by pyrolysis gas chromatography-mass spectrometry (Py-GCMS) and Fourier transform infrared (MFTIR) micro spectroscopy analysis. Elemental analysis of each layer was also undertaken by scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDS).

Preliminary results identified urushiol as the lacquer component, in combination with heat bodied oil; in several of the samples, tung oil was tentatively identified. Initial results of the technical study, including analysis of the structure and surface, strongly suggest that the wardrobes current surface presentation attempts to unify the cabinets. Ongoing curatorial research on both wardrobes including stylistic analysis of the form, decoration, and hardware indicates a mid-Qing dating.

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### **The Framing of a Masterpiece: The history and conservation of a monumental tabernacle frame**

*William B. Adair, Stephan C. Wilcox*

In the past, Museums sometimes deferred the care and treatment of frames in favor of the treatment of the paintings they housed. Often a new frame was selected over the old in accordance with changes in fashion, time and ownership. The old frames were then deaccessioned or put in storage, resulting in areas bulging with discarded frames waiting to be reunited with an appropriate painting.

This benign neglect has now actually provided conservators with rare opportunities for proper conservation treatments of important historical frames. In this paper, conservators William B. Adair and Stephan C. Wilcox, explain the various treatment options available and elucidate the rationale leading to the final decisions for conservation of the tabernacle frame for Bellini and Titian's *The Feast of the Gods*. The tabernacle frame has now been conserved back to its intended finish.

The *Feast of the Gods* was originally commissioned by the Duke and Duchess of Ferrara in 1514 as part of a series of paintings placed in an architectural setting for the Gonzaga's palazzo in Mantua. The frame, complete with pilasters and polychrome entablature, is considered by some to be one of the most important Renaissance paintings in America. In particular, the dilemma of what time in history a work of art should be presented to the viewer will be discussed. Starting in the mid 19th century, when the Camuccini brothers from Rome sold the *Feast of the Gods* to the 4th Duke of Northumberland, to the 1916 sale by London dealers Thomas Agnew and Arthur Sulley to Joseph Widener, and eventually bequeathed to the National Gallery of Art.

### **Aimee Spencer Gorham's Wood Marquetry of the Pacific Northwest**

*Nina Olsson, Dr. Suzana Radivojevic, Morgan Hayes*

The old growth forests of the Pacific Northwest provided the raw materials for the creation of a flourishing wood products industry during the late 19th and early 20th century. In 1905, the Lewis and Clark Exposition touted Portland, Oregon, as an ideal "City Beautiful," inspiring architects, artists and craftsmen to celebrate the regional beauty of pristine natural landscapes by building with native wood materials. It was in this forested backdrop that Aimee Spencer Gorham produced, from 1936 on, a series of site-specific large-scale wood marquetry murals under the WPA Federal Arts Project. She is best known for her work at Timberline Lodge, the greatest New Deal project of the area, where two of her pieces grace the walls of that temple to rustic regionalism.

Under WPA programs, Gorham produced marquetry murals for Oregon State University's School of Forestry, Portland Public schools, regional art centers in Oregon, and for the New York World's Fair in 1939. She established a workshop of furniture makers from Timberline Lodge that executed her designs beyond

the New Deal era into the 1950s.

In 2015, efforts began for conservation treatment of Gorham's 1938 mural "Send Us Forth To Be Builders of a Better World," the first since its installation, and the first technical study of Gorham's work. The mural, measuring 128 square feet, was designed specifically for the entrance foyer of Chapman Elementary School in Portland. Gorham used an extensive selection of domestic and exotic wood veneers to achieve remarkably varied effects of chroma, grain and chatoyance, that were identified during treatment. The veneers were adhered to plywood panels that were only then gaining popularity for interior decorative wall paneling, built-in furniture and cabinetry for modern architectural applications. The plywood substrate, quite novel at the time, provided the structural stability that allowed Gorham to extend the dimensions of her compositions to grand formats, resulting in panels that have remained quite planar despite the unstable environmental conditions in which they have been housed.

The Chapman mural had suffered considerable surface damage due to delamination of the veneer, scratches, vandalism, and inopportune previous coatings that had obscured the glowing figural effects of the wood grains. A group of conservators and researchers of diverse specialties (architectural, wood science, paintings, wood panel, objects) undertook the treatment, employing an interdisciplinary approach to address various aspects of the project. The mural was reinstalled in its original location in the summer of 2016.

The authors will discuss the conservation treatment of "Send Us Forth to be Builders of a Better World," and the particular technical aspects of the marquetry mural, in the context of Aimee Gorham's opus and her access to new innovative engineered wood materials manufactured in the PNW. Gorham's marquetry was a unique product of her time and place that combined the Arts and Crafts-inspired ancient technique of marquetry with the newest, cutting-edge industrial wood products of the era, mechanical presses, and industrial furniture coatings.

### **Treatment of Appleton Organ at the Metropolitan Museum of Art**

*Jennifer Schnitker, Manu Frederickx*

In 1982, the Department of Musical Instruments at the Metropolitan Museum of Art installed a fifteen-foot, sixteen rank pipe organ. Built in 1830 by the well-known Boston craftsman Thomas Appleton, this organ survived nearly musically unaltered, an unusual fate for such instruments and largely the effect of benign neglect. It is considered to be amongst the finest examples of Appleton's work, in addition to being the earliest known extant organ by him. At the Met, it has served as an important part of the musical instrument collection and has been played semi-regularly since 1982, to the delight of both public and patrons.

In February 2016, the Department of Musical Instruments closed its galleries to the public to begin a two-year gallery renovation project. This offered a rare opportunity for museum conservators, alongside an outside restorer, to undertake a substantial evaluation, documentation, and treatment of this important organ.

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The work undertaken on the organ can be divided into two categories: treatment of the musical mechanism and treatment of the casework. Treatment of the mechanism was critical at this point in time for satisfactory function of the instrument during performance. For the Appleton organ this included pipes, bellows, and windchest and was considered essential work in the scope of this project. Often this type of intervention requires a conservator of musical instruments to collaborate with outside builders and restorers who are expert in dealing with the musical implications of their interventions. Such collaborations are not necessarily straightforward and require time and compromise to obtain the best possible outcome for the instrument.

Intervention on the casework, was performed in house by the two musical instruments conservators. The organ casework has suffered the effects of cumulative light damage over the thirty years since installation. The mahogany boards and veneers have faded significantly and the restoration coatings of beeswax had become dull and grey-tinged. Conservation work focused primarily on the development of a two-part coating system which would protect the wood from further light damage and at the same time improve its aesthetic authenticity. It is clear that a treatment begins long before a conservator begins to touch a work of art and, further, that musical instruments bring their own challenges in terms of conservation, use, and display. The environmental challenges of the display location, feasibility and longevity of our interventions, appropriateness of restoration work, monetary and time costs, and role of the instrument within and outside of the institution all needed to be weighed.

While time and monetary costs of treatment are always significant factors in the decision-making process, in this case, the consequences of not intervening weighed heavily in the equation. The guarantee of further deterioration, at least in the short-term, a lack of aesthetic authenticity, and loss of public access to a playing organ in a museum collection, coupled with the fact that opportunities for intervention are rare, argued in favor of treatment of mechanism and casework.

#### **Structural Treatment of Wooden Beams**

*Mostafa Sherif*

Wooden beams of ceilings in historical buildings in Cairo are suffering from overloads, biodeterioration, and human and environmental deterioration that is causing cracks, deflection, and twisting or broken wooden beams. Study of wooden ceiling conditions in the Ganem Albahawan mosque in Cairo found a five broken beams and deterioration of wooden panels in the ceiling. A numerical study and specific survey of this case study was made through structural calculation for each wooden beam, and an intervention proposal. Furthermore, an experimental study is presented about use of fiber reinforcement polymers (FRB) to treat broken wooden beams. Three groups of wooden samples were used: small, medium and full-scale sample beams. The samples were evaluated by bending and testing strength, while the experiment study used many methods of treatment, changing the type of FRP or applying different methods to be calculated and suitable for the span, condition, and the load capacity of wooden beams. Results showed the ductility of wooden beams increased, to absorb loads of more ten times than before treatment; this revives the historical wooden beams so they can continue their function.

#### **Exposing Graffiti in George Washington's Cupola**

*Steven Stuckey*

Frequent visitation to George Washington's Mount Vernon home has been a common occurrence since the 18th century, and sometimes those visitors left a permanent memory. "Exposing Graffiti in Washington's Cupola" is about uncovering the signatures of guests visiting Mount Vernon during the 19th century and specifically leaving their mark in the iconic cupola. This paper will explore a change in an approach to treatment of the wood window architraves in the cupola that was initially designed to completely remove the existing coating, but was then modified to conserve specific layers of paint containing names, dates, and locations in pencil. Discussion will also cover varied techniques utilized for the pre- and post-treatment documentation of the architectural elements, including digital photography, measured drawings, computer generated modeling, and multi-spectral imaging. Lastly, the long-term maintenance and utilization of the architraves will address the plan for extending the life while displaying this unique piece of architectural history at Mount Vernon.

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### **Lessons from a Large-Scale Survey of Parchment Animal Origin and Production Quality**

*Matthew Collins*

Parchment manuscripts sit at the nexus of digital, biological and physical sciences, history, art, and literature. Can a simple PVC eraser link these together? Traditionally, an eraser is an article of stationery used to remove writing from paper. Yet when combined with biomolecular analysis it can also be a medium to ascertain the animal identity and production quality of medieval manuscripts. The eraser strokes the parchment generating a strong electrostatic charge which lifts the grime from the parchment surface; trapped in the grime are tiny amounts of biomolecules from the parchment itself, small samples yes, but enough to be analysed by modern instruments.

Parchment books and documents are the fundamental vehicle for the transmission and preservation of a millennium's worth of written culture. Hence their systematic study (palaeography, codicology and diplomatic) have long been recognized as essential disciplines for many areas of humanistic study. For scientists, however, the parchment record of the past represents an unrecognized and untapped reservoir of genetic and biological information. And because a considerable number of parchment books and documents can be precisely dated and localized—the molecular information derived from them has enormous yet largely unrealized value for the fields of bioarchaeology, paleozoology, anthropology, and historical ecology.

Both manuscript studies and biomolecular research are, in a sense, forensic: the former, because the disciplines of palaeography and codicology depend on exacting study of regularities in human production of one class of artefact; the latter, because biomolecular analysis yields the DNA of the animal that provided each individual leaf. However, these disciplines currently stand at opposite ends of the epistemological spectrum. Students of manuscripts and texts have long recognized that the most exacting study of individual artefacts is the necessary foundation of their work, even when they seek larger patterns. Science in contrast is moving towards a new mode of cognition enabled by mechanical information generation techniques. Colloquially known as “Big Data,” this new approach turns the old hypothetico-deductive model on its head to harvest data and share it across networks so that analysis is done by large teams seeking patterns in the data rather than seeking to corroborate prior hypotheses.

With the collaboration of colleagues worldwide who have sent us eraser shavings from parchment we are building up evidence of the exploitation of past animal populations and their distribution in time and space, and are adding a new category of evidence concerning the provenance of unlocalized manuscripts.

### **The Codex Eycckensis (8th century): Re-evaluation of the 20th century restoration & conservation treatments**

*Lieve Watteeuw, Marina Van Bos, Bruno Vandermeulen*

The Codex Eycckensis was most probably written at the scriptorium of Echternach (Luxembourg) in the 8th century, and was brought to Aldeneik (northeast Belgium) by Saint Willibrord. This restrained pre-Carolingian codex is a splendid example of the dynamic confluence in the 8th century of the insular formal idiom and the artistic characteristics developing on the European mainland. After the drastic conservation treatment of 1957 with heat sealing plastic foil, the Codex Eycckensis (8th century) was fully conserved in the 1990s by removing the Mipofolie lamination of the parchment and recreating the missing areas with parchment pulp. Since the conservation was finished in 1992, the manuscript was kept in the crypt of the Saint Catherine's church, a place with a highly unstable climate.

After 25 years, the need for a re-assessment of the Codex Eycckensis urges itself, the more that the possibilities for in depth research have developed considerably. In the ongoing survey, the condition of the parchment and the stability of the leafcasting with parchment pulp is evaluated. Multispectral imaging and material-technical analyses aim to shed light on the condition and the creation of the writing and illuminations of the pre-Carolinian codex. In the new study project (2016-2018), 25 years after, the codex will be re-assessed using non-destructive analytical and imaging techniques.

Linking conservation information of the past (1992) with new data, will evaluate protocols applied at the end of the 20th century and contribute to the future preservation of the Codex Eycckensis. During the campaign in the 1990s, no material technical analyses were carried out. The combination of XRF, XRF-mapping and Raman spectroscopy were used to characterize the materials and inks used in the Codex Eycckensis. The removed Mipofolie foils have been archived since the treatment in 1992. These foils were highly adhering to the parchment; it was not always possible to remove the PVC foils without removing some small paint fragments. These were analyzed using complementary but destructive analysis techniques aiming at the identification of organic components (binder/colourant). Complementary with the analytical data, imaging will contribute to the condition evaluation and material characterization. Within the framework of RICH (KU Leuven) a multispectral, multi-directional, portable and dome-shaped acquisition system has been developed to image with photometric stereo. Visualisation of pigments can be realized based on reflection maps. These findings are evaluated using the data obtained in a laboratory set-up and using the data obtained through XRF, XRF-mapping and Raman. The new assessment and technical study of the Codex Eycckensis reflects the complex material and conservation history of the 8th century codex.

As the treatment was well documented 25 years ago, the new data are adding multiple layers of information. This research provides new insights into the origin and the creation of the illuminations and contributes to the in-depth knowledge of the oldest manuscript kept in the Low Countries. The study gives

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reflection to the dynamics of conservation history, the importance of ongoing data collecting, revealing new challenges in technical documentation with recent imaging techniques and non-destructive analytical tools.

#### **Contacts That Leave Traces: Investigations into the contamination of paper surfaces from handling**

*Karin van der Pal, Simon W. Lewis, Wilhelm van Bronswijk, Rachel S. Popelka-Filcoff, Gregory D. Smith*

The contamination of paper surfaces during the process of handling documents is a significant issue for forensic scientists and conservators. In the forensic context, it has been found that polyvinyl chloride and latex gloves would leave handprints on porous and non-porous surfaces after 20-40 minutes of wear by a subject.<sup>[1]</sup> Anecdotally, it has been seen by both forensic practitioners and by fingerprint researchers at Curtin University that nitrile gloves can also leave fingermarks on paper after periods of wear. The issue of whether to wear gloves or not to wear gloves when handling documents has also been a matter of controversy in the conservation and archivist community.<sup>[2]</sup> Prue McKay at the National Archives of Australia carried out some preliminary studies to determine the potential for contamination from gloved and non-gloved hands when handling paper items.<sup>[3]</sup>

However, other than the papers mentioned above, there is a paucity of published research in this area. A research project has been initiated at Curtin to explore this issue by using a range of forensic fingerprint techniques to investigate the level of fingerprint contamination on paper items handled with bare and covered hands. Subsequently, the effect of latent fingerprints on paper items will be investigated using artificial aging. This presentation will give an overview of the background of the methods to be used as well as presenting some of our initial results. Acknowledgments: The authors thank Terry Kent and Prue McKay for useful discussion concerning this research.

References [1] Willinski G. J *Forensic Sci.* 1980; 25(3):682-685 [2] Baker C.A and Silverman R. *International Preservation News.* 2005; 37: 4-17 [3] McKay P. 5th AICCM Book, Paper and Photographic Materials Symposium. 2008; 1-10

#### **Revisiting Paper pH Determination: 40 years of evolving practice in the Library of Congress Preservation Research and Testing Laboratory**

*Cindy Connelly Ryan, Michelle Youket, Lynn Brostoff, Eric Breitung*

The pH of paper is a fundamental indicator of its long-term stability, and is routinely considered by conservators, cultural heritage scientists, and collection care professionals in the process of making decisions about collection storage, handling and access policies. The results of pH are frequently considered as part of conservation treatment planning, and are nearly always included in research studies related to paper preservation. An assortment of

measurement methods are currently in use.

This seemingly basic and familiar measurement, however, contains a depth and complexity that becomes apparent when pondering the differences between the industrial, ISO standard, and the numerous published variant methods, including surface measurements, miniaturized methods, cold extraction, and hot extraction. Are the results comparable from the different methods? Which approach is best? Over the last few years, the Library of Congress Preservation Research and Testing Division (PRTD) has revisited its standard protocols for pH measurement of paper and board in the contexts of quality assurance needs for collection housing and exhibition materials, special collections needs, and scientific research samples.

This talk will include a short discussion of the fundamentals of paper pH measurement, focusing on how aspects of sampling, sample preparation and measurement method affect the results obtained. The various methods in use in our lab from the early 1970s to the present will be discussed, with focus on our recent efforts to streamline our semi-automated measurements, to conduct direct comparisons between methods, and to develop a reliable miniaturized pH determination method.

#### **Centuries of Cellulose: Lessons learned from the molecular size of cellulose in naturally-aged paper collections**

*Dr. Andrew R. Davis, Dr. Fenella G. France*

Size-exclusion chromatography (SEC) has been used successfully for many decades as a tool to quantify the molecular structures of large synthetic polymers and to draw connections between molecular size and material properties. In contrast to the success of SEC for measuring synthetic polymers, paper and cellulosic polymers provide inherent difficulties for similar chromatographic analyses. Improvements in instrumentation and experimental procedures have slowly and markedly improved the current state of molecular characterization of cellulose by SEC.

This work begins to draw connections between the size distributions of cellulose molecules to the known properties of variously treated and aged collection materials. The Barrow Books Collection at the Library of Congress provided an excellent starting point for using SEC in complement with other analytical techniques, both non-invasive and destructive, to evaluate the long term stability and treatment of paper-based collections. Existing data from the well-characterized collection includes chemical-scale properties (e.g., pH and chemical functionality) up to macro-scale properties (e.g., mechanical strength and colorfastness). However, a gap has long existed between these two scales. Little data is available at the scale of polymeric macromolecules, where initially minute chemical changes eventually translate to macroscale degradation.

Recent work from the Preservation Research & Testing labs at the Library of Congress has used both the Barrow Books Collection as well as a selection of paper from American sources to investigate how SEC might be used to complement existing conservation data and analyses. For example, SEC quantifiably identifies the consequence of alkali treatments on preserving cellulose polymer chain

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lengths, which strongly correlates to eventual paper embrittlement. Attempts at correlating new experimental data with existing data from books in Library's collection also demonstrates the inherent challenges and opportunities for using SEC to identify structure-property relationships between the molecular structure of cellulose and the properties of aged paper collections.

Assessing various conservation treatments in this way could better inform conservators on predicting the efficacy of paper preservation treatments. It appears likely that minute changes in the statistical distribution of polymer sizes in aged paper, easily measured by SEC, could provide an early indicator of degradation and might allow improved design of artificial aging studies. More effectively linking micro analytical determinants to current destructive mechanical testing is critical for assessing use and condition of paper based historic collections.

### **Characterization of the Aniline Dyes in the Colored Papers of Jose Posada's Prints Using Time of Flight-Secondary Ion Mass Spectroscopy (ToF-SIMS) to Aid in Developing a Treatment Protocol for the Removal of Oxidized Tape**

*Stacey Kelly, Jodie Utter, Amy Walker, Ashley Ellsworth, Jenny K. Hedlund*

Jose Guadalupe Posada (1852-1913) was a prolific and influential Mexican printmaker; he produced thousands of images printed on a variety of poor-quality papers, often colored with vibrant but fugitive aniline dyes. The Amon Carter Museum of American Art has a large collection of approximately 400 prints attributed to Posada, many of which retain their bright color. A number of these are unstable due to oxidized pressure-sensitive tape residue, penetrating and weakening the short-fibered paper. In addition, aniline dyes are sensitive to solvents, complicating treatment.

Because aniline dyes have varying sensitivities to different solvents it is necessary to characterize them before an appropriate treatment protocol can be developed. A previous study of Posada's prints identified several aniline dyes using Fourier Transform (FT)-Raman spectroscopy. Of these, the yellow dyes could not be fully characterized. In this study, time-of-flight secondary ion mass spectrometry (TOF SIMS) was used to discern the dyes present in the colored papers with particular focus on the yellow dyes.

TOF SIMS is a valuable analytical technique for the identification of organic and inorganic components. Its high sensitivity and small sample size requirements make it potentially useful for the analysis of dyes and works on paper. For this study a selection of Posada's prints in various colors from the Amon Carter's collection were examined using TOF SIMS. Preliminary analysis has produced significant data for all the dyes analyzed. FT-Raman analysis was also conducted on these prints to verify the results.

As part of developing a treatment protocol for the Posada prints, an experiment was set up using artificially aged paper and tapes to simulate the removal of oxidized tape from fragile dyed papers. A variety of methods were employed. Samples were created by applying Scotch Magic™ tape (acetate backing; acrylic adhesive), 3M 2214 paper tape (crepe paper backing; rubber adhesive), gummed brown paper tape (kraft paper backing; starch adhesive), and Slime rubber cement to several c.1900s dyed and undyed broadsides, mimicking the Posada prints. The samples were then "treated" with solvent and suction, solvent vapor, solvent through Gore-tex sandwich, and rigid Gellan gum with solvent. The samples were imaged using visible light and Ultra-Violet (UV) before and after treatment, along with spectrophotometer readings to monitor and record any changes in the samples.

Because aniline dyes are prevalent in many turn of the century objects, as are oxidized tapes, developing an effective treatment protocol has tremendous potential benefit.

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### **Practice-led and Practice-based Collaborative Research at Tate: Supporting the advancement of modern and contemporary painting conservation treatment practice**

*Bronwyn Ormsby*

Several collaborative practice-based and practice-led applied research projects involving Tate and other key partners will be discussed. These involve treating specific conservation problems or exploring specific artist or conservation materials; all of which ideally contribute to the advancement of conservation treatment methodologies and practice for modern and contemporary paintings. Examples include the recent Rothko Conservation Project<sup>1</sup>, current EU-funded projects such as NANORESTART<sup>2</sup> and the Cleaning Modern Oil Paints (CMOP)<sup>3</sup>, as well as the ongoing collaboration between Tate, the Dow Chemical Company and the Getty Conservation Institute<sup>4</sup>. These projects can involve international and national collaborations between painting conservators, heritage scientists, paint chemists, as well as academic and industrial partners; many of which have been underway for several years (in some cases prior to Tate's involvement). Key aims and outcomes of these projects will be outlined, alongside reflections on research processes, as well as the ongoing challenges and successes of translating research findings into practice.

1. <http://www.tate.org.uk/about/projects/rothko-conservation-project>

2. <http://www.nanorestart.eu/>

3. <http://www.tate.org.uk/about/projects/cleaning-modern-oil-paints>

4. Ormsby, B.A., Keefe, M.H., Phenix, A., von Aderkas, E., Learner, T., Tucker, C., and Kozak, C. (2016). 'Mineral Spirits-based Microemulsions: A Novel Cleaning System for Acrylic and Other Modern Painted Surfaces'. *Journal for the American Institute for Conservation*. Issue 55-1, pp. 12-31.

### **Re-examining Old Findings and Inferences: The study of *A Magus at a Table* by Jan Lievens**

*Shan Kuang*

Jan Lievens and Rembrandt van Rijn were born just over a year apart, studied with the same master in Amsterdam, and maintained a close artistic relationship in Leiden from 1625 to 1632. Due to the many parallels in their early artistic practices and subject matter, even contemporaries were sometimes uncertain about the attribution of their works. It is perhaps not surprising that the attribution of *A Magus at a Table* (Upton House, National Trust) has been elusive. Previous attributions included Lievens, Rembrandt, and "after Lievens."

The painting is one of at least six versions of the same composition. In addition to the identity of the artist, the subject matter of painting is also unresolved. Perhaps the most inexplicable element of the picture is the extensive, tree-like foliage above the altar, in what would otherwise be an indoor scene. Despite the presence of *pentimenti*, the Upton picture was re-attributed to be a copy of a lost work by Lievens (c. 1631-2) after dendrochronology carried out in 1983 suggested a use date of "after 1660" (a date stylistically inconsistent with Rembrandt or Lievens). Recently, however, the accuracy of this dating has been questioned; it has been suggested

that the painting could be an original work.

In this study, various findings and interpretations from 1983 were re-evaluated in light of recent technical scholarship and advances in analytical techniques. This includes a re-evaluation of dendrochronological data from 1983, with further analysis carried out in 2014 by Ian Tyers. Emerging analytical and imaging technologies like macro x-ray fluorescence scanning (MA-XRF) provided key new insights into the painting's materials, construction, and relationship to the other versions.

Technical examination shed light on the numerous stages of reworking in subject matter and composition. Crucially, MA-XRF (carried out by University of Antwerp) revealed important *pentimenti* painted in earth, black, and copper-containing pigments, which were previously invisible in x-radiography. This paper will also reflect on how incorrect data given by dendrochronology in 1983 was able to skew the interpretation of many other technical findings. Certain old assumptions and interpretations were thus challenged in light of the new results. Aspects of the painting technique that were previously assumed to be uncharacteristic of Lievens or Rembrandt have been re-assessed in the context of the significant body of technical and historical research published on the artists since the painting was last examined. These findings allowed the Upton picture to be re-attributed as an original painting by Lievens, rather than one of the many copies after a lost work.

### **A Confusion of Colors: Yellow and red pigments in the decorative scheme of the tablinum in the House of the Bicentenary at the archaeological site of Herculaneum**

*Leslie Rainer, Kiernan Graves, Gilberto Artioli, Arlen Heginbotham, Francesca Piqué, Michele Secco*

The conservation of the architectural surfaces in the tablinum of the House of the Bicentenary at the ancient Roman site of Herculaneum is a collaborative project of the Getty Conservation Institute, the Herculaneum Conservation Project and the Soprintendenza Pompeii. As part of this project, a study was undertaken by a multi-disciplinary team comprised of conservators and conservation scientists to understand the effects of the catastrophic 79 CE eruption of Mt. Vesuvius on the wall paintings at Herculaneum. Due to the eruption, Herculaneum was destroyed as a living city, and yet preserved nearly intact for two millennia, buried under twenty meters of volcanic material.

Discovered in 1709, and excavated as an open-air site in the early to mid-twentieth century, Herculaneum preserved a wealth of Roman cultural heritage, including the exquisitely painted walls of the tablinum of the House of the Bicentenary. The decorative scheme of the tablinum is composed of red, yellow and black monochrome backgrounds with decorative borders and floral and architectural elements. In the center of each wall are figurative scenes emulating portable paintings. As a result of the eruption, the wall paintings suffered severe damage and alteration, notably in large swaths of yellow monochrome background converted to

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red when exposed to the heat generated by hot mud and ash from the volcano. This color shift significantly changed the appearance of the decorative scheme.

The objective of this study was to distinguish the fields of original red monochrome background from the fields of red, which had converted from yellow due to heat from the eruption. The methodology followed for the study consisted of preliminary background research, a stylistic study of similar wall painting schemes in the region, and materials analysis to identify original and altered yellows and reds in the tablinum.

Based on the background research, conservators and scientists worked together to develop an approach to analyze the monochrome fields of original and altered red paint in the tablinum in order to characterize their pigment compositions and differentiate between them. Portable X-ray fluorescence spectroscopy (XRF) was used in situ to map the monochrome backgrounds. Laboratory analysis, using optical and electron microscopy, x-ray diffraction, and micro-Raman spectroscopy, was conducted on representative samples collected from areas retaining original yellow color; areas thought to be originally red; and areas thought to be originally yellow, now appearing red.

These analyses suggested that the paints were not made with pure ochre pigments, but contained admixtures of secondary materials in small amounts, which appeared to be different in the yellow and red fields. This paper will present the results of the research showing that the compositions of the original and altered reds were sufficiently different to be distinguished from one another. The results of the study have contributed to a better understanding of the original decorative scheme of the room, and the implications for conservation and interpretation. Moreover, the methods developed here can be used to better understand Roman painting technology and potentially identify original and converted pigments at other sites in the Vesuvian region.

#### **A Preliminary Investigation into Aquazol® as an Alternative Lining Adhesive for Paintings**

*Blair Bailey, Nicola Grimaldi, Dr. Charis Theodorakopoulos, Dr. Roger Penlington, Raymond Aso, Richard Campbell, Ben Dawson, Kallum Moses*

Lining has existed for hundreds of years through its early uses in artist studios to present iterations within conservation. Many paintings suffer from sensitivities to heat or moisture - two key hazards of current lining adhesives and methodologies. This paper, as part of a collaborative pilot study, explores Aquazol (poly-2-ethyl-2-oxazoline or PEOX), as a novel lining adhesive. As a tertiary amide polymer, it features a neutral pH, solubility in a variety of organic solvents, and no discoloration upon aging. Key physical characteristics include high strength and flexibility in shear tests, as well as an easily altered flow rate and glass transition temperature of 69-71°C. Additionally, PEOX is non-toxic. All of these characteristics suggest possible viability as an adhesive for lining paintings on canvas.

Aquazol 500 was tested on two traditional substrates of de-crimped linen, as well as polyester sailcloth and set using both

heat set and cold lining methods. The addition of natural thickening agents such as agarose and xanthan gum decreased wicking into canvas and provided added strength. Through 180° T-peel and shear testing in Northumbria University (Newcastle Upon Tyne, UK) mechanical engineering department, quantitative results match qualitative experience of increased lining adhesive bond strength and flexibility.

Further examination under magnification indicates a nap bond and, after reversal through force, minimal adhesive residues remain on the original object verso. The initial results with Aquazol 500 as a lining adhesive are positive and offer much hope for further research. Significant additional testing into effects of aging, climate, and the addition of biological media are necessary before recommendation as an alternative lining adhesive.

#### **Gecko-inspired $\mu$ -Dusters for Cleaning: Ongoing research and potential for art conservation**

*Cynthia Schwarz, Hadi Izadi, Kyle Vanderlick*

The presentation will report on the status of the ongoing research project on the use of  $\mu$ -dusters in art conservation. Inspired by gecko adhesion, fibrillar microstructures ( $\mu$ -dusters) show great potential as a dry cleaning material for removing particulate contaminants (loosely referred to as dust) from surfaces vulnerable to mechanical damage from dry cleaning, such as acrylic paintings and daguerreotypes.

In collaboration with the Department of Chemical & Environmental Engineering at Yale University, we have demonstrated successful dust removal from a variety of solid surfaces using polymeric  $\mu$ -dusters. When they touch a contaminated surface,  $\mu$ -dusters of controlled interfacial and geometrical properties develop intimate contact with both surface contaminants and substrates. However, development of stronger interactions with the contaminants allow for their removal from the surface. Further, preliminary testing on poly(methyl methacrylate) (PMMA) thin films (as model substrates for acrylic paint) demonstrated that by moving the adsorbed particles from the tip to the side of the fibrils and consequently removing them from the contact interface, polymeric  $\mu$ -dusters are less likely to result in abrasive action on the surface than solid flat dry cleaning materials.

This new generation of dry cleaning materials is attractive for use in art conservation for this non-destructive quality as well as for the very low potential of residue deposition on the artwork's surface. While the method is primarily targeted at removing loosely bound contaminants such as dust,  $\mu$ -dusters present an advantage over with traditional dusting methods, such as brushing or air flow in that they have been shown to remove sub-micrometric contaminants that are not able to be removed by these methods. Colorimetry and gloss measurements and photomicrographs will be taken of artificially soiled acrylic paint samples before and after soiling and cleaning. The results will be compared to existing dusting and dry cleaning methods. The micropillar cleaning material will be also evaluated based on user experience. Suggested areas of further investigation will be presented.

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### **Pioneering Solutions for Treating Water Stains on Acrylic Paintings: Case study *Composition, 1963* by Justin Knowles**

*Olympia Diamond, Maggie Barkovic, Bronwyn Ormsby, Maureen Cross*

This collaborative case study outlines the criteria leading to the treatment of disfiguring water stains on a large-scale, acrylic dispersion canvas painting: *Composition, 1963*, by the British artist Justin Knowles. Decision making factors include how the “negative space” of the exposed acrylic-sized canvas impacted the understanding and interpretation of the work and thus influenced the treatment methodology. Investigations into the artist’s practice provided an important context for a conservation treatment, which prompted an exploration into the use of agar gel as a delivery system for aqueous cleaning solutions.

*Composition* is a brightly colored hard-line geometric abstraction juxtaposed against an unpigmented acrylic dispersion-sized canvas. Accidental water damage produced tidal stains across the canvas, rendering it unexhibitible. In 1973 Knowles lost more than one hundred of his paintings in a studio fire, driving him into a twenty-six-year hiatus from painting. Very few of these early developmental works by this prominent contributor to the British Abstract Art movement survive, and therefore this was a significant opportunity to conserve this rare painting.

Determining the most appropriate conservation treatment was complicated by both a lack of research into the treatment of water stained canvases, and the presence of an unpigmented acrylic dispersion-size layer. Investigation into the relationship between materials and meaning in Knowles’ work, along with the cleaning of acrylic paintings, textiles, and works on paper aided in the development of a tailored cleaning solution to minimise risks to original materials whilst also facilitating the reduction of the stain.

The painting materials were characterized using microscopy, IR, and UV fluorescence, FTIR spectroscopy and XRF analysis.

FTIR spectroscopy confirmed the presence of a p(EA/MMA) acrylic dispersion copolymer medium in both the paint and the unpigmented size. From these investigations, six water-stained test canvases were created, light aged for two years under museum conditions<sup>i</sup>, and then naturally aged for one year in dark storage. These samples were used to assess the effects of twenty-two aqueous cleaning solutions, applied both in solution and through agar gel. The results were evaluated using colour measurement<sup>ii</sup> and through visual observations by four paintings conservators. The effect of the preparation of the agar gel and the way it was applied were evaluated through a series of studies. Potential changes to the sized canvas surface were investigated using optical microscopy, Hirox 3-D digital microscopy<sup>iii</sup>, highlight-based RTI, Atomic Force Microscopy, SEM, and FTIR-ATR spectroscopy. The results showed changes in surface morphology, which supported the need for designing optimal methods for both the preparation and application of the cleaning systems.

The painting treatment proceeded successfully to the point where the stain was substantially reduced. Retouching was the final stage of treatment aiming to reintegrate treated areas with the original surface, focusing on matching color, texture and gloss. A number of retouching media commonly used on acrylic paint were evaluated, and a successful method was found with Aquazol 50. As a result of this applied, collaborative research, a unique and important work has been successfully returned to displayable condition.

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[i] Conditions in the light box were at ~ 28°C and 22% RH. UV was filtered out from the light bulbs. Assuming reciprocity of exposure at 200 lux for 10 hours a day for 730 days (2 years) with an average lux in light box of 7,980 lux resulted in 183 hours exposure in the light box.

[ii] A Minolta CM-2600d spectrophotometer using CIE Lab DE\*ab colorspace was used to make colorimeter measurements. The results of the colorimeter readings were evaluated in tandem with the conservator’s subjective observations concerning change in colour and gloss for each test.

[iii] Hirox 3D digital microscope images were taken at Tate, London, 2016.

## 1. Identification and Analysis of Hard Water Staining on Granite in the Western United States and Comparative Study for Cleaning Methods

*Alex Beard, Jason Church, Ifrah Jamil, Caitlin O'Grady, Bilal Khurshid*

Hard water staining on granite is a matter that affects many outdoor and indoor monuments. This is exceptionally worrisome for memorialists, monument builders, cemetery staff, and families. The severe delimitation of granite headstones in the Western United States, particularly in Colorado, Utah, New Mexico, and Nevada, is a topic of concern. The stones in these geographic regions are weathered, stained, cracked, and covered in mineral deposits and scaling; some granite headstones exhibit delimitation after only four years. The scaling and delamination from hard water exposure has weakened the granite structurally and is cosmetically; the stones have become visually detracting and unstable, potentially posing a safety hazard for visitors. This paper aims to provide the reader with the knowledge required to make an informed decision when faced with an issue of hard water staining on granite. This study investigates both chemical and mechanical treatment of the stones as well as preventative maintenance practices to consider. All the treatments tested are commercially available and have been evaluated based solely on their performance results. Projects Aims: The main objective of this project is to inform people of the issue: hard water staining on granite, particularly in the Western region of the United States. We aim to discern what is causing the staining and delamination of the granite through scientific testing and replication of the scaling on monitored samples and controls. And, we aim to test treatment and cleaning options, both mechanical and chemical. Once the data has been analyzed we want to inform the public about the most effective procedure for removal.

## 2. Rescuing Schools: Conservation program of historical educational buildings in the city of Rosario, Argentina

*Carolina Rainero*

The aim of this paper is to highlight an ongoing conservation program developed at the Universidad Nacional de Rosario, specifically the establishment of an innovative management model regarding the conservation of educational heritage in the city of Rosario. Background: In the Province of Santa Fe, the Ministry of Education is responsible for school buildings. While new schools have been built, there is no formal conservation program for historical educational buildings. Unfortunately, the budget towards their maintenance is insufficient. The resources are used when the only alternative is repairing these centenary buildings when they are on the verge of collapsing.

The Rescuing Schools Program has proposed an innovative, participative and decentralized management concept where the educational community is linked to the inhabitants of the neighborhoods where the schools are located, to the University, to the Ministry of Education and to the companies that are interested in contributing to the protection of educational heritage. This model is based on a management protocol, which is at the same time the regulatory framework of all actions. The program under my direction is developed by three academic units: Architecture, Law, and Humanities and Art. The working teams include students, professors and staff of the selected

schools for the beta trial.

The aim of our program is to optimize the maintenance and preservation of the buildings, and ultimately to promote the development of a Conservation Program of Historical Educational Buildings. The first actions were focused on the survey and registry of the buildings, and the assessment of the socio-educational contexts of each school. In a second stage began the development of a digital database – available online – that will allow the enquiry of the information gathered and the proposed actions.

Currently, we are compiling an inventory and catalogue of goods, including their conservation status, that will allow us to establish priorities for future interventions. To properly preserve the educational heritage, it is necessary to document, study and define intervention projects that include instances of survey, analysis and diagnosis of pathologies, in conformity with international conservation standards, and make a commitment to monitoring and fulfilling preventive maintenance actions. This stage will be formulated in agreement with the Provincial administration and implemented by the interdisciplinary teams of the University.

Preliminary conclusions:

- The community feels committed to preserving the education heritage.
- By optimizing the processing times of the proposals and making rational use of the available resources, we get closer to a sustainable conservation program for the local educational heritage.
- Through the articulation of public-private financing, the adaptation and rehabilitation of educational establishments can be addressed. The Ministry of Education has found the program as a suitable model to be applicable in different areas of the province. Cooperation agreements have been signed with the University to:
- Conduct periodic monitoring of the state of conservation of buildings.
- Document the conservation projects.
- Establish a commitment regarding the maintenance of the buildings – a preventive conservation program – which reduces the need for interventional conservation treatments.

## 3. Cellulose Nanocrystals and Nanofibrils for Coating of Paper Artifacts

*MSc. Camilla Camargos, Dr. João Figueiredo Junior, Dr. Fabiano Pereira*

Paper artifacts constantly demand conservation and restoration treatments. Nanocellulose (namely cellulose nanocrystals, CNC, and cellulose nanofibrils, CNF) has been studied for filling paper losses on cultural objects (Camargos 2013; Camargos 2016). CNC have great crystallinity, which enhance their chemical stability, and CNF have improved mechanical behavior (superior tensile strength and stress-strain performance). Previous research is patented under Brazilian National Institute of Industrial Property (Camargos et al. 2014). Therefore, recent developments aim at improving processes of coating paper for both protect and consolidate paper objects.

Cellulose nanocrystals consist essentially of crystalline domains of cellulose in nanometric scale obtained by the acid hydrolysis of cellulose fibers. Cellulose nanofibrils, on the other hand, are micrometer-long entangled fibrils that contain both amorphous and crystalline cellulose domains (Habibi et al. 2010; Abitbol et al. 2016). pH measurements indicated that both CNC and CNF polymers have stable pH around neutral values. Crystallinity index was estimated by X-ray diffraction and FTIR. Results showed superior crystallinity for CNC (86,0 - 100,0%) than for CNF (66,2 - 64,4%) and Eucalyptus fibers (76,7

- 67,0%), which revealed a higher chemical stability for CNC polymer. Mechanical testing was provided by stress-strain measurements. CNC polymer is too brittle and Eucalyptus fiber sheet (without any additives) is too weak, so these materials were not tested by stress-strain test. CNF, otherwise, presented great tensile strength (255,3 MPa) and maximum strain (25,4%). These results indicate that a material made with CNC and CNF can be suitable for both stability protection and mechanical consolidation when used as paper coating nanomaterial.

Preliminary assessment of CNC and CNF coating was carried out combining both nanostructures in three different materials composition: 25% CNC 75% CNF, 50% CNC 50% CNF, 75% CNC 25% CNF. The polymers were applied upon 20th century paper sheets (wood pulp). Best results were observed for 50% CNC 50% CNF, which presented high transparency, homogeneous dispersion upon paper surface and noticeable increment on mechanical strength.

Abitbol, T. et al., 2016. Nanocellulose, a tiny fiber with huge applications. *Current Opinion in Biotechnology*, 39, pp.76–88. Camargos, C., 2016. Compósitos de Nanocristais e Nanofibrilas de Celulose: Preparação, Caracterização e Potenciais Aplicações em Processos de Restauração de Documentos e Obras de Arte sobre Papel. UFMG. Camargos, C., 2013. Obtenção e avaliação de polpa de papel de nanocelulose (whiskers) como material para reintegração de lacunas em documentos e obras de arte em papel. UFMG. Camargos, C. et al., 2014. Polpa de papel de nanocelulose, processo para obtenção e uso na restauração de obras de arte e documentos em papel (nanocelulose paper pulp, preparation process and use in the restoration of paper artworks and documents), BR1020140073639. Habibi, Y., Lucia, L. a. & Rojas, O.J., 2010. Cellulose nanocrystals: Chemistry, self-assembly, and applications. *Chemical Reviews*, 110, pp.3479–3500.

#### 4. Local Cleaning of Stained Artworks on Paper: The new possibilities of rigid gels

*Sophie Barbisan, Anne-Laurence Dupont, Catherine L. Maynor*

The recent introduction of rigid or semi-rigid gels (gellan gum, agarose, agar, xanthan gum, etc.) to the field of paper conservation opened new possibilities for treatments, especially for local cleaning. Such gels can be used with aqueous cleaning systems optimized via pH and conductivity adjustment and through the addition of buffers, chelating agents or antioxidants. To the best of our knowledge, parameters including chemical additives as well as the long-term consequences of such treatments remain open questions. Those questions are particularly important regarding local cleaning of stained artworks, due to the tendency of rigid gels to create a new wet/dry interface (or tideline) during treatment.

A first investigation was started in 2015, in collaboration with the CRC (*Centre de Recherche sur la Conservation des Collections, Paris*) during a master's thesis research. The study was devoted to the specific use of agarose gel with adjusted pH and conductivity for local treatment of tidelines on paper. Tidelines were created on samples of artificially aged Arches® paper. Different combinations of pH and conductivity were tested to evaluate which are best for cleaning. It appears that alkaline pH and high conductivity were efficient for the cleaning of tidelines on the samples. Nevertheless, comparison with other solutions used to prepare the gels showed that calcium hydroxide solution is best for the cleaning of tidelines. The long-term effect of local treatments was also investigated using hygrothermal ageing of the cleaned samples. Despite the use of cyclomethicone solvents and pre-humidification to limit the diffusion of water, UV fluorescence was observed. This resulted from the creation of a second wet/dry

interface during treatment. Fluorophores being precursors of colored compounds, this result emphasizes that local cleaning should be approached with caution. A “sandwich” configuration was also tested, by applying on one side of the sample the agarose gel prepared with a calcium hydroxide solution to clean locally the tideline and on the other side gellan gum covering the whole sample surface. This configuration showed promising results in terms of cleaning, aging and avoiding the creation of a second wet/dry interface during treatment. This sandwich method is nevertheless only applicable to artworks that can be wetted on their entire surface.

The research will be continued starting in the fall of 2016 at the Smithsonian American Art Museum, and will be dedicated to the use of rigid gels and the optimization of the aqueous systems for local treatment of stained artworks on paper with water-sensitive media. Colorimetry measurements will be used to determine the cleaning efficacy of different gels made with buffers, chelating agents and antioxidants. The long-term consequences of those chemical agents, coupled with local cleaning will be evaluated by using artificial aging. As previous research has shown that local treatment can lead to unwanted long-term effects, new solutions will be tried to avoid formation of tidelines such as using an interface made of paper or applying cyclododecane. The paper's surface will be examined using optical microscopy. The first results of this research will be presented here.

#### 5. Analysis of Synthetic Dyes and the Treatment of 1910s - 1950s Historic Chinese Wedding Documents

*Paul Chun-Wo Chan, Edward Chun-Yiu Law, Angela Wai-Sum Liu*

New technology can unlock the secret of dyes used in historical artifact and facilitates the formulation of appropriate conservation strategies for preserving cultural heritage. The application of advanced analytical techniques, initially developed in the field of analytical Science, provides conservators a tool to identify composition and to review information of where, when and how the artifact be formed. The result provides insights to conservators to devise a comprehensive treatment proposal. In recent decades, numerous literatures had been reported in the identification of dyes used in historical paintings or textiles with various analytical techniques. Yet, the analogous studies of dyes on Chinese documents are less explored. With continuous interest to investigate the dye used in Pearl River Delta region in China, herein we describe an investigation of synthetic red dyes used in a set of Chinese wedding documents predates from 1910s to 1950s which are the collection of Hong Kong Museum of History. Marriage is of fundamental significance in the rituals of traditional Chinese culture, which are generally known as the “Three Covenants and Six Rites.”

“Three covenants” are the wedding documents exchanged between the two families to confirm the engagement of marriage, which are important records for the Chinese heritage and thus of great historical significance. Most of the documents have suffered from various degrees of paper damages such as tears, lose, distortion and running of the colour. Hence, an effective and safe conservation treatment is of stark importance. Red is an auspicious color which usually corresponds to good fortune and happiness, hence the traditional wedding documents are all made in red. Natural red dyes such as Ocher (mineral dyestuffs), Alizarin (plant dyestuffs) and Carminic acid (animal dyestuffs) were originally used in ancient time. They were the only source of red until synthetic dyes were introduced to China in the late 19th century. Since

then, natural dye had been entirely replaced by synthetic dyes due to the wider color ranges, composition uniformity, low costs and stability towards fading. However, most of them are water-sensitive required special attention. To shed light on their histories and associated chemistry of the dyes, samples from the wedding documents taken at ten-year intervals were subject to study by various analytical methods including UV-Vis spectroscopy, TLC and Ultra-performance liquid chromatography with both diode array UV-Vis detector and time-of-flight mass spectrometer (Reverse phase UPLC-DAD-ESI-Q-TOF-MS). In the preliminary investigation, four synthetic dyes (Rodamine B, Rodamine 575, 2-Naphthol orange and Aniline yellow) have been identified, indicating that they were already commonly applied during that period of time. Given the identified dyes are all relatively water soluble, conservators should consider alternatives to traditional wet treatment method, such as a dry lining Chinese mounting method for this type of wedding documents. This paper will extensively discuss on the new findings and this special technique in the course of treatment.

### **6. The 3M Approach to Preventing Mould Growth in the National Collection at the Heritage Conservation Centre (HCC), Singapore**

*Jingyi Zhang*

The 3M approach consisting of Monitoring, Maintenance and Management has been adopted by the Mould Management team in HCC to mitigate the risks of mould growth in the National Collection. The key highlights in each aspect would be presented to elucidate how the 3M approach has been instrumental in reducing mould incidents in the centre's repositories.

The Monitoring aspect is one that includes the annual quantification of mould levels in the air and surface levels at different locations in the stores using a Merck Mas-100 ECO air sampler and sterile swabs in a specified surface area. Cut off values for both methods of quantification were also established to serve as a warrant for more detailed checks when the levels are over the limits. Another critical element under the Monitoring aspect would be analyzing the quantified mould levels with previous occurrences alongside the type of material and method of storage to rank the stores according to priority for store checks and emergency planning purposes.

Working with both Estates management and the Environmental monitoring team on ensuring the relative humidity and temperature in each store is being maintained at the correct set points, is one important component in the Maintenance aspect of the 3M approach. Working on housekeeping projects and reducing dirt and dust at point of entries are also ways to ensure that the environment is being maintained at an acceptable level of cleanliness. Having a set of operational response in the face of a mould outbreak and the know how to carry out collection recovery are also ways to manage mould related incidents, prevent further spread and future occurrences. Training for staff and the constant refinement and improvisation to the operating procedures are also important areas that are emphasized in the Management aspect.

### **7. A Novel Conservation Treatment Developed for the Restoration of The Psalms of David Relievo Papier-mâché Binding Designed by Owen Jones**

*Malina Belcheva*

On January 8, 1903, Ryerson and Burnham Libraries received a gift from Mr. J. E. Woodhead, one of his most valuable books, the first edition of *The Psalms of David* (The Victoria Psalter). Designed by Owen Jones, this oversize relievo papier-mâché binding was dedicated to Queen Victoria: "To Her Most Gracious Majesty Queen Victoria this illuminated Psalter is with permission dedicated." Owen Jones created both the interior ornamentation of the chromolithographed plates and the exterior aspect of the book. The binding was carried out by Leighton, Son & Hodge and printed at Remnant & Edmonds, London in 1861, where the covers were moulded in relief and embossed on calf leather by Frederick Leake's patented process.

On request of Mr. Woodhead in the 1800s, the book was reformatted to an album structure binding. New cloth hinges and paper stubs to the plates were added. The binding was "rebound in old covers," read the unknown binder's note uncovered under the front pastedown leaf during the book conservation. New endsheets and gilt to the textblock edges were added. Over the years this beautifully designed book had been constantly on display exhibited standing on a pedestal as intended by Owen Jones. The heavy binding structure and oversewing of the textblock caused significant damage to the spine and plates of the binding.

The book had been set apart from the libraries' collections for years awaiting conservation, and was received in the book conservation laboratory of the Art Institute of Chicago in poor, unstable condition, after multiple falling apart repairs: with missing leather spine, plates detached, in losses and deterioration, the endsheet marbled papers were brittle, textblock sewing and stubs collapsed, covers were detached, with abraded edges and corners missing. From this condition of the binding, the restoration process was begun. This poster for the conservation treatment of *The Psalm of David* will include: Historical background, bibliographic information, provenance, and acquisition information about the book. Binding description before conservation and detailed description of the reconstruction of the binding from compositional information of the original binding materials, through making of a model for the new binding structure, to the finishing processes of the latest book conservation. In conclusion, I will include information on the exhibition of the binding at the Art Institute of Chicago, and will discuss future directions and perspectives for *The Psalms of David*. Additional information on the conservation process of the binding is on the Art Institute of Chicago website - [http://www.artic.edu/aic/resources/resource/2346?search\\_id=1&index=0](http://www.artic.edu/aic/resources/resource/2346?search_id=1&index=0)

### **8. Conservation and Restoration of the Document called 'Carta sincronológica de Historia Universal' (Chronological Chart of Universal History) translated by Francisco J. Zavala, 1884**

*María Victoria Casado Aguilar, María del Pilar Tapia López*

The objective of this paper was the preservation of a document with a measure of 7.5 meters (295.2") wide by 0.7 meters (27.5") long. It belongs to the Benemérita y Centenaria Escuela Normal del Estado de San Luis Potosí, (Meritorious and Centennial Normal School of San

Luis Potosi, México), and has as title “Carta sincronológica de Historia Universal.” It is a long strip conformed by 14 individual panels attached together and printed with a chromolithographic technique in four inks (black, red, blue and yellow). The document with the assistance of illustrations and texts, represents the history of humanity through multiple timelines, starting from the biblical creation of Adam and Eve (year 4000 a., according to the chart) to the year of 1884. This chart is a Spanish edition, printed in Guadalajara, Mexico, translated by Francisco J. Zavala, from the famous work in English of Sebastian C. Adams, the “Chronological Chart of Ancient, Modern and Biblical History,” 1871. The graphic document was in a roll format and with has an auxiliary support made with fabric in the back.

Apart from the damages caused by dust, moisture stains and microorganisms, the paper had serious structural problems that made it impossible to manipulate or consult it without causing more physical damage to the support. The paper was separating in layers, generating losses in the form of flakes from the top layer of paper, which contains the printed information of the work. The conservation proposal was somewhat controversial, despite the fact that it was an essential part of the work; maintaining the original format of the roll was detrimental to the preservation of the support, as the weakening and flakes losses was caused by the action of winding and unwinding of the roll. Preserve the roll format after a support's consolidation limits and restricts the use and study of the document. Considering that the work belongs to the library of a school in Mexico, its main value is to transmit the information contained within, and the possibility of generating more data from future study. After several discussions, it was decided to alter the original roll format to maintain plain the support paper, so the auxiliary fabric was removed and changed for a Japanese paper lining, and a structure of a folding screen was implemented, with separators added between the panels to make the folds in these separators without affecting the paper. This new format maintains the support paper plain, facilitates the consultation of individual panels, like the leaves of a book, while it enables one to extend the document completely, which maintains the notion of a work of great format.

## 9. Election Cake and Tea Cookies: The Conservation of Historic Cherry Hill's Receipt Book Collection

*Samantha Couture*

Historic Cherry Hill is a non-profit museum in Albany, New York. It consists of the residence and many of the belongings of the Van Rensselaer family. The recipe books were kept by five generations of the women of the household and is made up of twenty manuscript volumes and collected manuscripts and printed newspaper clippings. They contain recipes for food, medicines, and household products from the late 18th to the early 20th centuries. These volumes are of particular interest to food historians. Access to these items was severely limited because of their condition. The institution sought and received grant funding for conservation treatment. Much of the information in the books was obscured by excessive tearing, sewing that prevented pages to be fully opened, and clippings that had been pinned to the pages. The museum's curator felt it intrinsic to the research value of the collection that the books remain as close to their original state as possible.

My challenge in conserving these volumes was to give researchers access to all manuscript text while maintaining as much of the original structure and placement as possible. Treatment decisions were made in close collaboration with the curator. Torn pages were pieced together

and mended with Japanese tissue and wheat starch paste. The metal straight pins were removed and clippings were hinged in place so that the underlying text can be revealed without damage to the clippings. The many oversized clippings were clearly marked with their original placement and stored in separate folders, as were any that were printed on acidic paper. Bindings were repaired or replaced where missing. Each volume was evaluated individually to decide when to leave clippings in place and when to remove them entirely. One volume was a repurposed account book. The manuscript text was obscured by clippings of recipes and information about gardening. These clippings were left in place, given the relevance to the subject of the collection and the scant amount of writing underneath. A second repurposed volume is a journal with by entries by one of the women of the family, about twenty pages at the end of the volume. The clippings covering this text came off to reveal academic notes on astronomy, including diagrams of stars and planets. We still wanted to be able to recreate the journal as it was used as a recipe book. The removed clippings were placed in Mylar sleeves and can be laid on top of the page they came from, thus recreating how the page looked as it was used as a recipe book. The earliest two volumes, which are of greatest research interest and were in the worst state, were digitally scanned after mending and before rebinding. These are now digitally accessible, and all twenty volumes are now available to researchers. Historic Cherry Hill has published some of the recipes from this collection.

## 10. Towards Nondestructive Characterization of Black Drawing Media

*Nathan Daly, Lynn Lee, Michelle Sullivan, Karen Trentelman*

Historically, works of art on paper have proven challenging objects for scientific analyses. Due to the lower concentration of materials used in these works, sampling is not possible as removal of a sufficiently large sample would be visibly and irreversibly damaging to the work, necessitating in situ analysis methods. As a result, conservators and curators have come to rely upon close observation—at both the macro and micro level—as their primary means of differentiating drawing media. However, because this is a subjective approach and highly dependent on the experience of the observer, this is a challenging, if not impossible, task. Many drawing materials—particularly carbon-based drawing materials—are extremely similar in appearance. Visual distinction and identification is further complicated by the varied methods of application and manipulation artists employ.

In 2016, the J. Paul Getty Museum presented the exhibition “Noir: The Romance of Black in 19th-century French Drawings and Prints” which featured drawings by Georges Seurat and Odilon Redon, among others. The works of these artists, deceptively simple in appearance, represent complex mixtures of black media including charcoals of varying hardness, assorted crayons, natural and fabricated chalks, ink, and pastel. In conjunction with this exhibition, curators, conservators, and scientists at the J. Paul Getty Museum and Getty Conservation Institute initiated a collaborative study to address the problem of accurate characterization of black drawing media. Specific research questions included: Is it possible to distinguish different types of black drawing media—such as chalk, crayon, and pastels—based on binder or clay content? Did the artists use fixative? If so, what is the composition and how was it applied? Have the media or fixative altered with age?

To develop an effective, noninvasive, analytical framework for the study of drawings from the Museum's collections, studies were

conducted on mock-ups prepared with historic and modern artist's materials to characterize the materials present and understand the complex media-substrate interaction. A suite of noninvasive techniques were utilized in this study. Micro-Raman spectroscopy was used to identify carbonaceous materials such as charcoal by examining two characteristic spectral features, the D band and G band. The ratio between the intensity of each band can be used to estimate the degree of crystallinity of the carbon species, which can then be matched to reference materials for proper identification.[1] Fourier Transform Infrared (FT-IR) spectroscopy was used to aid in characterization of organic binding media and fixatives, and to support the black media assignment made using Micro-Raman spectroscopy. X-ray fluorescence (XRF) was used to identify inorganic elements such as aluminum in chalks. In situ x-ray diffraction (XRD) was used to characterize minerals in clays. Collectively, these analytical techniques successfully characterized the materials used by the 19th century French artists, providing insight into the development of modern drawing. Additionally, this work provides a framework to address the need for noninvasive analytical methods to study low concentration materials in situ.

1. Coccatto, A., J. Jehlicka, L. Moens, and P. Vandenabeele, Raman spectroscopy for the investigation of carbon-based black pigments. *Journal of Raman Spectroscopy*, 2015. 46(10): p. 1003-1015.

## 11. Moth Larvae Infestation of Books and Materials from Syracuse University Libraries

*Marianne S. Hanley*

During a recent incident at Syracuse University, a professor on campus discovered moth larvae on a "few library books" in her office, one of the oldest buildings on campus. They immediately contacted me, the Preservation Librarian. In my initial assessment, I discovered approximately 1000 books, binders, and file folders in the professor's office, 441 of which were books from the SU Libraries; the remainder belonged to the professor personally. More than half of the books were infested with maggot larvae. The worms attached themselves to the books, papers, furniture and walls throughout the professor's office.

We began the task of bagging every book in the office, regardless of whether they belonged to the Libraries or were the professor's personal books. It took the two librarians all day to complete; 19 crates of books and several boxes of papers were transported to freezer units in the dormitories. I secured space in a large freezer found in one of the dormitories usually used to freeze mattresses that are infested with bed bugs. Two additional freezers had to be moved from the Libraries Special Collections to handle the overflow. The books were frozen at -10F for 3 weeks. At that point, with no living organisms found during a random inspection of several books, librarians and staff cleaned the books with Absorbent Dry Cleaning Sponges and Natural China Chip Brushes. In our initial assessment, we counted the affected volumes and made on-site risk assessment; it was difficult to count the affected volumes because it was difficult to see how many volumes were infested until each was pulled from the shelf and assessed. The largest concentration of insects was found in the bindings; they seemed to be attracted to the glue. We used flashlights to assess if there were any infestations attached to spine cloth. If anything was detected we removed the covers, cleaned the spine, and reattached new spine lining. Old spine stiffeners and book cloth were removed and replaced. Planning, communication and organization were a key to success. Luckily, we have a disaster supply plan and a large supply of conservation disaster materials if the need

arises and we were able to utilize the materials and resources required to address the problem. To begin work we needed: 1. Large zip lock bags to place every item in; 2. Crates; 3. Gloves/masks; 4. Van to transport books/papers to freezer. Due to the number of items infested we recommended freezing, both to kill the insects and give us time to get staff and materials in order to begin the cleaning. We were used to dealing with insects and their effects in small numbers, but we had never seen infestation to this extent concentrated into one area. The project was a challenge both logistically and practically but it was comforting to note there was no lasting damage to the items and no resurgence was noted.

## 12. A Study on the Design to Store Asian Painting Scrolls

*Junyin Hsiao*

The hanging scroll is a unique form of East Asian painting. The elegant art is composed of not only the great painting but also the mounting structure comprised of laminations of textile and paper. Meanwhile the scroll keeps the entire structure at minimum volume for easily transport and storage. Traditionally these hanging scrolls are rolled on the roller rod while in storage, which will lead to cockling after extensive time in storage.

For several years, East Asian painting conservators have tried to solve the problem of cockling by increasing the diameter of the scroll when rolled. In order to increase the diameter, several materials and forms currently are used to reduce the cockling. The following are the different types of rollers to preserve East Asian paintings: Polyester Roller, Zotefoam Roller, Acrylic Tube Roller and Paulownia Roller Clamp. There are advantages and disadvantages among all these four types of rollers. The Polyester Roller is easy to manufacture, but too weak structurally to protect the artefact even with added support and cushion inside. Therefore, using the Polyester Roller can cause damage and deformity while handling. The Zotefoam Roller provides better structural integrity, but still cannot be manufactured (by hand or by machine) in a way that fully encloses the rod of the scroll. The Acrylic Tube Roller cannot be made by hand, so a machine must cut through a hard, cylindrical piece of plastic making manufacturing unpredictable and difficult. Even worse, because acrylic is not very pliable, after it is cut, the tube naturally retains its cylindrical shape (as in it wants to fold close) thereby making safely inserting the painting scroll into this device difficult. Paulownia wood Futomaki seems to have the best design to use and manufacture, but provides the worst archival quality among all these options because of the natural acidity of the wood itself.

This poster serves to provide a solution to uncover the best design and materials used to protect East Asian paintings through conservation science in the hope that after significant amount of time in storage, the scrolls won't experience the problem of cockling. Several parameters need to be considered. First, a perfect roundness on section of the roller plays an important role, otherwise the painting will become wavy after a long time. In addition, enough structural support from the roller structure is necessary to protect the painting from any dents while a person handles the scroll. Lastly, even the gap created at the entry point of the roller should be seriously considered and attended to because a gap that is positioned facing up may cause the part of the painting (that is even slightly exposed) to distort due to gravity. Through accelerated aging, we can choose the best shape to best fit the East Asian painting. Passing the Photo Activity Test will tell us if the material of the roller meets the criteria for archival quality.

### 13. Innovational Drying Wall for Asian Paintings

*Yi-Hsia Hsiao*

East Asian scrolls are well known for their rolling and unrolling system. Above all, flatness, softness, thinness, and smoothness are the four characteristics of a good Chinese painting scroll. Drying process for Chinese paintings is one of the important treating steps among all. Speaking of drying board, one would think about a Japanese Karibari which is an orange board with multi layers of paper on top of undercore of wooden lactic and coated with persimmon juice. This orange board, however, is distracting to some degree compared to otherwise a white board, when a conservator retouching on compensation for losses on a thin Chinese xuan paper, due to the transparency of thin xuan paper. This topic first introduces traditional Chinese methods and techniques of making drying boards and drying wall. The undercores of wooden lattices, multi layers of paper and application methods are introduced. Then, the innovation of drying boards is secondly introduced. Gator boards are the replacement of wooden lattices due to their light weight. This new innovation is nowadays widely used in East Asian paintings conservation studios within the US. Finally, techniques of making a drying wall are introduced because it is essential for an oversized Chinese painting, which usually poses a big challenge for conservators. A comparison for pros and cons among the innovational and traditional drying board/wall is discussed. The waterproof coatings on the board surface are compared in the end. Chinese drying boards and walls are coated with animal glue solution. Japanese drying boards are coated with persimmon juice. The innovational coating that is used in most East Asian painting conservation studio in US is Rhoplex™ emulsion. Different kinds of Rhoplex™ are experimented to test for its durability, waterproofness, and stickiness. The Asian conservation studio in Cleveland Museum of Art has Japanese Karibari with persimmon juice coating, innovational drying boards with gator boards as undercore and Rhoplex™ coating and traditional drying wall with animal glue coating. Those have their advantages and disadvantages.

### 14. 21st Century Loss Compensation for a 19th Century Binding

*Kathy Lechuga*

Loss compensation and integration of new binding elements is a constant challenge faced by book conservators. Digital print fills for paper conservation can be used for loss compensation in patterned papers and cast composite leathers have gained popularity as a material that can be used to better integrate traditional book repairs with original binding elements. The treatment presented in this poster combines both methods to recreate missing components of a 19th century binding to produce an aesthetically integrated structure that facilitates use by our patrons. *Public and Private Economy*, published in 1836, arrived in the lab with only its front board precariously attached with pressure sensitive tape to the spine of its text block. All other original binding elements were missing. Much of the carrier layer of the tape had previously detached, removing a significant portion of the grain layer of the original leather resulting in a large loss almost the height of the board. The original front board was structurally sound and covered with a uniquely patterned decorative paper that was heavily abraded.

It was obvious a new binding needed to be constructed around the remaining front board and conventional loss compensation

choices would have created an extremely stark and aesthetically jarring binding. Cast composite leather, a technique developed by Grace Owen and Sarah Reidell at the New York Public Library Goldsmith Conservation Lab, was used to recreate the missing leather components of the binding by applying it to a cotton cloth and kozo fiber paper laminate. Experiments were performed to determine which laminate structures would yield the most flexible rebacking material for this book. The cast composite leather film was also used as a fill material to compensate for the heavily skinned and abraded areas of the original leather remnants. Digital printing has been discussed recently in the field as a method for loss compensation for printed or decorative works of art on paper. In this treatment, a scan was taken of the original board and a digital print was created on a pigment printer to be used as the covering material for the newly constructed back board. The print was further inpainted and toned with acrylic paints and coated with SC6000 to better integrate it both visually and physically with the original binding elements. In the end, these new techniques produced a robust, aesthetically harmonious binding that will produce a pleasing experience for our patrons during use.

### 15. An Unconventional Approach to Cover-Binding Reattachment

*Kimberly Kwan*

Materials and techniques for sewing and forwarding, such as the choice of sewing support material, lacing in methods, and corner mitring styles, can provide information reflecting period bindery practices or reveal new information on provenance. Often, these components of the binding structure are hidden underneath the covering material and can be difficult for researchers to see. This poster will describe the considerations behind a cover reattachment method used during treatment of MS. 74 (1658-1659), an English manuscript belonging to the Medieval and Early Modern Manuscripts Collection at the Harry Ransom Center, University of Texas at Austin. MS. 74 was bound in full tanned sheepskin over pasteboards, and the covering leather was almost completely loose from the binding. During treatment of the manuscript, the covering leather had to be fully detached. In a typical conservation treatment, the leather covering material is re-adhered overall to the paperboards and back of the book. In this case, the cover leather was secured in a manner whereby the structure could remain visible. The cover leather was secured to the binding mechanically so that it could be detached and taken off the binding. A method was devised to strap the covering leather onto the book with interlocking tabs. Strategic placement of the tabs was crucial so that the reattached cover would move with the book properly during use. Especially important, the hinge of the covering leather had to be secured to the book to prevent improper creasing and breakage to the leather. Experiments with a combination of materials including Japanese tissue paper, parchment, and Tyvek® were tested on models.

A criteria for the ideal tab material was drawn up:

1. The material had to be weaker than the leather to prevent strain and damage.
2. The material had to be flexible enough to wrap around the boards.
3. The material had to be strong enough for the tabs to withstand being opened and closed periodically.
4. The material had to be relatively rigid at the interlocking component to withstand tension and lock properly.

5. The material had to be thin enough not to indent the textblock paper, which was very soft.

Treatment of MS. 74 was a collaborative effort. Graham Patten carried out mends to the textblock and leather cover, resewing of the textblock, and board infills during his internship at the Ransom Center. Book lab staff, interns, and volunteers worked on consolidation of the iron gall ink throughout the textblock. As several other books awaiting treatment at the Ransom Center also have detached covering material, treatment of MS. 74 became an opportunity to examine methods for a safe way to reattach a cover to the binding while allowing access to the interior binding structure.

## 16. Measuring the Stiffness of Brittle Paper

*Andrea Hall, Thomas O'Connor, Molly K. McGath, Patricia McGuiggan*

It has been estimated that one third of the paper materials in libraries are too brittle to handle. The structure of a typical paper sheet is comprised of semi-rigid cellulose fibers. These cellulose fibers are more than ten times longer than the sheet thickness and can be considered a two dimensional random fiber network. The main pathways of paper degradation, acid-catalyzed hydrolysis and oxidation, cause depolymerization of the cellulose chains and breaking of the intrafiber bonds, directly impacting the paper's physical properties. Conventional mechanical measurements of aged paper are destructive and often too severe to understand the true extent of deterioration. We have compared the reproducibility and results of the rolling test, fold endurance test, tensile tests and have developed a new test, the JHU bend test. The goal of these tests is to measure the strengths of naturally aged papers with varying amounts of brittleness. Through this comparison and the use of mathematical modeling developed by the JHU Department of Physics and Astronomy we show the limits of each test and relate the state of paper degradation to test results.

## 17. Acid Transport through Mylar Encapsulation

*Andrea Hall, Molly K. McGath, Bill Minter, Patricia McGuiggan*

Ultrasonically-welded encapsulation of documents with biaxially-oriented polyethylene terephthalate, commonly called by the commercial names of Mylar® or Melinex®, is a frequently employed treatment in library and archive collections. Encapsulation is used to reinforce a document physically and is used as a long-term storage solution. The transport of acids through this barrier is of interest, especially in light of using this treatment for long-term storage of an acid containing document, i.e. newspaper, wood-pulp paper document, among others. The transport of acid through the encapsulation barrier impacts surrounding media, while trapping this acid within the encapsulation can accelerate deterioration. Prediction of the rate of acid transport will allow conservators to make informed choices about housing and long-term storage conditions. This research studies the kinetics of acid transport through the encapsulation, providing a rate and direction of transport of acids through the encapsulation.

## 18. Development of a User-Driven Adhesives Database

*Shaina Palmer, Andrea Hall, Molly K. McGath, Sara Zaccaron, Robert Leheny, Patricia McGuiggan*

The quantity of adhesives that are currently used within conservation is both a blessing and curse to conservators. The immense number of adhesives available provide the potential for tailoring adhesives to a particular application, however this same variety can present a paralyzing wealth of choice to conservators. We are developing a user-driven database to share the properties of adhesives used in conservation. This will assist conservators in making choices about new adhesives. The study of the rheological properties of conservation adhesives, in concert with AFM, light microscopy and mechanical testing forms the basis of our research. This research builds on past research that has been done by conservators and scientists, bringing industry scientists to the table.

## 19. Polishing Methods and Their Impact on Results in the Oddy Test

*Chloe Cao, Andrea Hall, Molly K. McGath, Patricia McGuiggan*

The Oddy test, with its many variations, has been used to determine the suitability of materials for use with museum, archive and library objects. One major variation of the Oddy test has been in the preparation of the metals used for this testing. These variations include different sources and types of metals: using metal foils from chemical manufacturers to metal coupons from jewelers, as well as different polishing methods of the coupons prior to exposure to tested materials. This research examines differences in polishing of these metals, and how those difference impact the results of the Oddy test. This is done by examining different polishing methods and their effects on the coupons by light microscopy and atomic force microscopy both before and after testing.

## 20. Cellulose Acetate Lamination: Composition and Condition

*Molly K. McGath, Emily Rezes, Vicki Lee, Andrea Hall, Patricia McGuiggan*

Cellulose acetate lamination of paper documents was a common preservation/conservation treatment in the 20th century. This treatment fell out of favor due to concerns over the stability of the cellulose acetate films used for lamination, the compositions of which changed over time. However, many collections contain large numbers of cellulose acetate laminated documents. This research evaluates how the chemical composition of these films today has impacted the overall condition of the laminated documents, using a combination of techniques. Analyses with pyrolysis-gas chromatography/mass spectrometry, infrared spectroscopy, nuclear magnetic resonance spectrometry, surface pH testing and microscopy have been done to evaluate the composition of the lamination films today. The results show trends in how composition of the films changed over time and how this composition has impacted the survival of these laminates.

## 21. Memory of the World: Opportunities for preservation and promotion of documentary heritage

*Ingrid Frederick*

The objective of this poster is to discuss how collections of world significance could potentially benefit in preservation and promotion purposes, from assessment as world heritage site and possible inclusion on the UNESCO Memory of the World Register. Established in 1992 as a Program within the Communication and Information Sector in UNESCO, the Memory of the World's main aim has been to protect the world's documentary heritage.

Preservation of documentary heritage goes in hand with permanent accessibility of movable heritage such as manuscripts, oral tradition recordings, maps, and other audiovisual recordings. After almost 25 years, 107 countries have included examples of their documentary heritage included in the Memory of the World Register. These include single items as well as collections, which have been assessed for their world significance against different comparative criteria.

## 22. Captain America Encounters Klucel M®

*Michiko Adachi, Catherine Magee*

The first six issues of the Captain America comic books (1941) from the Serials Division at the Library of Congress required treatment to permit use by researchers. The issues had been side-stapled with heavy staples to form a textblock, then glued into a case binding. The extreme brittleness of the paper and the tightly bound format caused the paper to break during even careful handling. Library of Congress conservators, in collaboration with the Serials curator, determined that a combination of stabilization and rebinding was necessary to achieve the desired access to the comic books. However, the brittleness of the newsprint and the solubility of the printing inks presented challenges in selecting a mending material. The treatment required investigation of a range of potential adhesives to be used in a solvent-set tissue for mending. This poster chronicles the development of a pre-coated repair tissue for the treatment. Since solubility testing indicated that both paper and media were sensitive to water and to ethanol, graduate interns Catherine Magee and Michiko Adachi experimented with different adhesive and solvent combinations on an expendable, vintage comic book to determine the appropriate mending materials. They first identified a suitable paper base. Out of six different adhesives tested as solvent-set mending strips on the expendable comic book, Klucel M® was selected for the adhesive coating due to its strength and transparency. Experimental comparison also identified a solvent for re-activation of the adhesive. Color formulae for toning the tissue, for better visual integration with the design media of the comic books, were developed. The resulting toned, pre-coated repair tissue was used successfully to stabilize the pages of Captain America. Following stabilization, the pages were individually encapsulated in polyester film sleeves, and then bound as single issues into specially designed, stab-sewn, scrapbook-style bindings. The conservators hope to use this treatment protocol for future treatments of comic books and other newsprint ephemera at the Library of Congress.

## 23. Ancient Repairs in Limp, Laced-Case Sixteenth-Century Bindings: Record, analysis and interpretation

*Pilar Tapia López, María Fernanda Martínez Rocha*

This work was Fernanda Martínez' thesis to become a restorer, under the supervision of Dr. Martha Elena Romero Ramírez. It is an archaeological study of ancient repairs in limp, laced- case binding in parchment on 16th-century European printed books, belonging to the National Library of Mexico, and which came from New Spain's conventual libraries. Repairs usually go unnoticed, and because of that, become vulnerable to getting dismissed during conservation and restoration treatments, due to a lack of appreciation.

The main objective of this study was to make a detailed record and an analysis of the repairs with the purpose of contributing to their appreciation as historic evidence of the book's use, trade and market in a specific society and period of time, and therefore as important elements of the bindings that need to be conserved. Another objective was to provide the conservator with more information to make better and more appropriate decisions for the conservation and restoration processes in bibliographical materials, avoiding the loss of valuable information and features that contribute to material, historic and documentary values of this type of heritage.

The sample included 222 books, of which 172 had some kind of repair, material replacement or modification in one or several structural components. Said components were: textblock, endleaves, spine and linings, sewing, endbands, cover and fastening. The record was made using as a basis the record form elaborated and used by Dr. Martha Elena Romero Ramírez in her doctoral thesis for the study of limp, laced case binding in parchment on sixteenth-century Mexican printed books. This allowed the author to continue the same investigation line by generating information that complements a previous work. Through this study, it was possible to obtain information about the different techniques used to repair the books, by the people or the workshops that made the repairs to the conventual libraries. This was achieved by identifying patterns of work and materials in books belonging to the same convents and/or religious orders. Knowing and valuing the different characteristics of the collections, and how to approach them constitutes a way of preventive conservation, by avoiding material information loss due to lack of knowledge.

## 24. History, Treatment, and Preparation for Digitization of 14<sup>th</sup>-century Estate Rolls

*Annabel Pinkney*

Composed of over 85 percent collagen, parchment substantially differs from paper and must be treated accordingly by a conservator. In ancient and medieval times information was commonly written upon parchment membranes which were sewn end to end, then rolled into extensive documents referred to as estate rolls. These long sheets of parchment have proven to be inconveniently bulky research use and preservation strategies. Parchment rolls have often been disassembled, and then conserved by treating and storing flat as separated membranes. This method eradicates the original format of the artifact and destroys its historical context. The purpose of this research is to develop a reliable methodology to effectively treat the vast surface area of medieval rolls, provide the rolls with the strength and flexibility to be physically handled in future research endeavors, and to maintain

the documents' rolled format, thus preserving their historical integrity. Two rolls from France, dating from 1370 and 1371, each measuring over forty feet long, were studied in the process of developing this method. The treatment process was separated into three stages: cleaning, humidification, and repairing. Through an intense study of the material properties of parchment, each of these stages consisted of unique treatment techniques which catered to the size and composition of the rolls. Among the most noteworthy developments in this process was a handling system to administer treatments on large sections of roll at a time, eliminating the need to separate the membranes. The conservation was concluded by designing a storage system for the rolls. The resulting storage design is space efficient, user friendly, and convenient for display. The applied treatments effectively resulted in each roll attaining an ideal state, true to their originally intended form. In order to protect the integrity of any artifact it is important to respect its original composition and configuration. The ability to conserve a medieval parchment roll of any size without disassembly has been established by this work.

## 25. Thoughtful Withdrawal of Monographs from Academic Libraries: Knowing the risks to our cultural print heritage

*Jennifer Hain Teper*

Academic libraries are faced with pressing space issues and insufficient funding. In light of these pressures, libraries are more aggressively withdrawing materials to relieve cramped shelves and reduce overall collection footprints. Selection for withdrawal is based off many factors, but of particular concern is the withdrawal of materials relative to titles being held in shared print repositories. Recent publications point to the need for thoughtful and strategic evaluation of shared print for quality and completeness as well as evaluation of copies considered for withdrawal if we are to ensure the perseverance of an accurate representation of our print heritage in an increasingly digital library environment. This paper will discuss two related studies that enlighten us on the current practices for selection for withdrawal in academic libraries, as well as the risks libraries may be taking in basing print retention decisions on shared catalog records alone. In spring of 2015 the author, as a member of a small group of interested preservation librarians and conservators, created and distributed an online survey to academic libraries across the United States. The focus of this survey was to document what information and procedures their peer libraries currently utilize when considering the withdrawal of a monographic title from their local collection. The survey collected 99 valid responses and focused on analyzing current withdrawal practices and policies as well as specifically focusing on the impact of either access to electronic content or a commitment to retain a physical copy at another institution or shared print repository on those practices. While not the main focus of this presentation, the information collected from this survey will help to frame the main substance of the talk, focusing on the variation between "identical books" as defined by the shared print community. This bulk of this presentation will focus on the findings of a recent study of books cataloged as identical, but upon physical reviewing showing differences in editions, printings, condition, and treatments. Currently, the author is completing data collection from a physical comparison of forty-four theoretically identical monographic titles held by their library consortia, the Big

Ten Academic Alliance (fifteen large academic libraries). Each title shares identical OCLC cataloging records and should therefore be identical or near-identical publications. Data being collected include bibliographic accuracy, printing and binding variances, completeness, physical damage, chemical deterioration, and provenance. Results are also being compared to existing digital content in the HathiTrust, a trusted digital repository. Early data show wide variability both in the accuracy of cataloging records, as well as in historical use, condition and ability for materials to be successfully digitized in the future. While condition and unique features are sure to vary, the similarities of the fifteen institutions would have a higher likelihood for similar storage and preservation than in many other more diverse libraries, so any variations found in this study are likely to be present, if not increased, among the broader academic library community.

## 26. Innovación en Conservación y Cuidado de las Colecciones en soporte papel

*Alicia Tonello*

The Innovation in Conservation and Care Paper Collections Conservation of library and archival collections of archives is a subject that has been installed for years in the policies of public and private institutions. What do professionals have to do? What procedures must they use and follow? Which new acquisitions, materials and purchases, such as new equipment and chemicals safe for both humans and the environment safety as well as able to prevent the archives' and books' deterioration. These new acquisitions must help us to prevent the risk of deterioration of paper supports or at least to stop their degradation; to extend as much as possible in time "the loss of value" of the document collections. Our experience is from several years of hard, daily work in a National Archive, where the archival material begins in the colonial time and reaches into the late last century. It shows us that we will not have the opportunity to stop the damage if we do not carry out simple but systematic procedures and routines such as deep cleaning the buildings, storage, and packages as in the records themselves. Dirty, dust, greasy, air pollution are "the mother of all the damages" and without forgetting the control of the deterioration agents and the good practices in the handling during the archival work as well during the public archival access. The real innovation in the care of archival collections is to improve forms of access to the original documents through good quality facsimiles. This allows us to provide users the feeling they are in contact with the original and the fact does not diminish their use facsimiles information. It is true that in other countries this is an everyday custom, because users can access databases and digitized archives quickly and can access the original, print it or even treat it with software applications. This is not the reality of some National archives in Latin America, where today you can get colonial documents photocopied, with the serious damage that this procedure causes in the paper supports. While laws of access to public information force us, the archivists, to give citizens the records, in the National Archives we should always insist on the preservation of documents, mainly the historical documents. The National Archive of Uruguay has implemented a Conservation Policy, the prohibition of the users' manipulation of the colonial documents and struggles for the independence as also those of the early years of the republic that are already digitized. The majority of the ancient archival documents are kept in good conservation conditions in a conservation chamber providing them to the best standards of stable temperature and relative humidity to avoid the appearance of risks damages.

## 27. (I Can't Get No) Documentation: Preservation reporting in the Archives

Marissa Vassari, Julia Welby

In accordance with the archivist's core value of affecting workflows that prolong the lifecycle of our collections, the Rockefeller Archive Center (RAC) has been taking a hard look at the role of preservation practices across our organization. As our institution grew over the last forty years, our preservation documentation proved insufficient and inconsistent. As members of the Collections Management team, we have explored documentation practices that promote interdepartmental communication, transparency among staff, and long-term tracking of all preservation decisions and work done on our collections. Incorporating best practices, we have developed and implemented a Preservation Report. This presentation will examine the report's elements and share how use of the form has impacted our organization over the last year. The success of the Preservation Report is ultimately tied to its longevity. We wanted to create a form that could be broadly applied to the full range of preservation steps available at our organization. We do not have a designated conservation department, and as a consequence, practical preventative preservation is our goal. The report identifies the item(s) slated for preservation, notes the collection information, and lists any format specific requirements. There is a designated section for detailing the current condition of the material, a space to summarize the executed preservation plan, along with a note of where the material is located in the vaults. Preservation project work is executed interdepartmentally, and as such, tracking location of the item is vital. This is particularly pertinent as it relates to our revamped digitization program that pulls together members from teams across five departments. We define transparency as a state in which the staff is able to easily discern not only who is responsible for a project, but also others who are assisting, consulting, and being informed. Specific to preservation projects, the report includes a chart that identifies specific staff members by role for each necessary task. Acknowledging that members of our staff have different areas of expertise, our institution strives to collaborate so as to break out workflows that best promote long term preservation of our archival holdings. Integrating this chart in the report allows for a clear work plan and encourages interdepartmental communication. The "why" behind a final preservation decision is an integral part of an item's preservation story. It is our goal to share that story with both current and future staff. Corroborating with professionals in other institutions has confirmed that current best practices are being followed at the RAC. The Preservation Report we created encourages accountability and alleviates the complications of using multiple forms of documentation for the same project. Moreover, it has proven to be an effective way of reaching our documentation objectives and, ultimately, supports the RAC's interdepartmental goal of transparent collection care and long-term preservation.

## 28. Necessity is the Mother of Invention: DIY iron (II) test paper

Julie Biggs, Claire Dekle, Cyntia Karnes, Yasmeeen Khan, Susan Peckham

Conservators researching the effects of ethanol-modified washing and complexing solutions at the Library of Congress monitor ink-inscribed paper for iron (II) ions, an indicator of ink corrosion. Since

commercially produced iron-gall ink test papers are available only as narrow strips, conservators developed a method to produce test papers in house by saturating filter paper with bathophenanthroline solution. The proposed poster will show how to make iron-gall ink test paper and how to use it effectively, including wetting up the paper prior to testing and maintaining contact between the indicator paper and the ink-inscribed areas.<sup>1,2,3,4</sup>

(1) Jan Neevel, " (Im)possibilities of the phytate treatment," in *Postprints of the Iron Gall Ink Meeting 2000*, (Newcastle, UK: Conservation of Fine Art, University of Northumbria, 2001), 125-134.

(2) Elmer Eusman, "Aqueous treatment effects of iron gall ink: Monitoring iron migration with the Fe(II) indicator test," in *The Broad Spectrum: the art and science of conserving colored media on paper*, ed. Harriet K. Stratis et al. (London: Archetype Publications Ltd, 2002), 122-127.

(3) Claire Dekle and Mary E. Haude, "Iron-gall ink treatment at the Library of Congress: old manuscripts--new tools," *The Book & Paper Group Annual 27* (2008), 15-26.

(4) Jan Neevel and Birgit Reissland, Bathophenanthroline indicator paper: development of a new test for iron ions 2005, *Papier Restaurierung 6*, no.1 (2005), 31.

## 29. An Enclosure for a 3-D Object in a Scrapbook

Noah Smutz

For this poster, I will focus on one aspect of a treatment I performed on a scrapbook. Scrapbooks are inevitably found in almost all archival collections. Due to their storage in archives and libraries, scrapbooks routinely find themselves on a book conservator's bench. They are usually made from cheap materials and were produced at high speed and low cost. Once bought, they are usually overstuffed with items by their owners. These things all contribute to conservators interacting with scrapbooks. While they end up in the hands of a book conservator it is not uncommon to find some very unbook-like things within a scrapbook. These are usually three-dimensional objects. This led to me investigating how to best preserve these objects in scrapbooks without removing them from the page.

As part of my summer internship at the University of Kansas, I treated Emery McIntire's scrapbook. This scrapbook was in particularly poor condition and as part of the treatment it was decided to keep it disbound. It contains some amazing things. These included firecrackers, part of a football, part of a bleacher (I think), and most incredibly a 100-year-old piece of hardtack. Hardtack is a military food ration that was used for hundreds of years. It is comprised of flour and water and is baked repeatedly in order to remove all the moisture from it so it will not rot. This is why a piece can survive in a scrapbook for 100 years! In its final form, it is an inedible brick. Usually to ingest it soldiers would dunk it in water or preferably coffee to make it more palatable. The main questions brought up by finding a piece of hardtack in the scrapbook were: How do we conserve hardtack? How do we conserve it while keeping it a part of the scrapbook? And how do we provide access to it without further damage coming to the hardtack?

My goal in treating this page was to make the page accessible for both staff, to keep the hardtack on the page, and to do these things in as simple a way as possible. The enclosure developed to store this page is a five-layer stack. The outer two layers are pieces of corrugated board with 6 ties attached to each. The next layers are in Ethafoam corrugated board laminates that act as spaces for the hardtack on one side of the page and a dance book on the other. The inner layer is a double window mount in which the page is float mounted to display

the page and to allow it to be handled without touching the page. This enclosure allows for the page to be moved and viewed while being supported and without worry of further damage occurring. This is a solution that is usable for any three-dimensional object found inside a scrapbook if the desire is to keep it on the page, and the page can be stored separately from the scrapbook.

### **30. Conservation in Miniature: The merger of museum object and historic interior in the treatment of a Victorian era dollhouse**

*Sarah Giffin*

The conservation and restoration of antique dollhouses is an infrequently discussed theme within conservation practice. Despite there being about 172 institutions worldwide that have at least one dollhouse within their collection, publications on the subject are few and far between and typically relate to specially funded projects or exhibits. This is unfortunate as dollhouses occupy a unique intersection within conservation practice, acting as both a moveable museum object as well as a miniaturized historic interior. Although dollhouses are both portable object and architectural space, the published treatments that exist for these tiny homes often focus only on methods used within the conservation laboratory and disregard the dearth of information from the architectural and historic interior conservation sector. This paper argues for the use of architectural preservation techniques miniaturized to dollhouse size as a viable method of preserving dollhouses while simultaneously addressing the architectural qualities of these miniature homes. To demonstrate this, the author will focus on the treatment of a Victorian-era dollhouse at the Horniman Museum and Gardens in London, United Kingdom. Specifically addressed is the in-situ treatment of aged and water damaged wallpaper that was bubbling and lifting from the walls of many of the rooms in the house. The author decided to adapt a method used by wallpaper conservators to re-adhere the paper in-situ, so as to preserve it within its architectural context. Nevertheless, this method had to be creatively adapted in order to fit within the size of the rooms and prevent further damage caused by adhesive type. It was determined that the best way of treating the Horniman Dollhouse's wallpaper was by humidifying the paper with a medical nebulizer and injecting the lifting bubbles with 3% w/v Klucel G in acetone using a 10cc syringe and needle. Areas that had torn and were lifting were re-adhered with a Klucel G film, reactivated through the wallpaper with acetone and a brush. The miniaturized treatment method allowed the author to work within the size constraints of the rooms, while also maintaining the integrity of the house as a domestic space, albeit a tiny one. The results show that the adaptation of historic interior conservation techniques to the micro-scale opens up a dearth of architectural conservation literature that can be used by objects conservators, as well as allowing for the holistic treatment of dollhouses as an interior rather than a conglomeration of material types.

### **31. Under Close Observation: A pilot study monitoring change in objects' conditions**

*Vincent L. Beltran, Foekje Boersma, Jim Druzik, Ashley Freeman, Michal Lukomski, Joel Taylor*

The push for more sustainable climate management strategies has challenged the conservation field to review its environmental standards and

guidelines for collections. While some members of the conservation field are working under new specifications that allow a broader climatic range, there is nonetheless lingering uncertainty within the profession about the consequences to collections from adopting a more liberal approach to exhibition and storage environments. A major impediment to a wider acceptance of broader environmental parameters is the recognition that the field currently has an incomplete understanding of the chemical and mechanical reactions of some hygroscopic materials to relative humidity and temperature levels outside a narrow range.

Invaluable data can be obtained from examining objects rather than just materials, which when combined with scientific data, can identify more precisely under which conditions irreversible damage occurs as a result of climatic fluctuations. This poster will highlight a pilot study developed for the Managing Collection Environments Initiative at the Getty Conservation Institute. The study monitors the condition of a small collection of wooden objects under controlled humidity variations. The objects are of different age, construction, thickness and have different finishes, to represent some of the variety found in museum collections. As the objects adapt to different relative humidity levels, the change in their condition is monitored and documented. The methods used range in sensitivity from precise observation and conventional photography to acoustic emission (AE). All techniques will be described in more detail in the poster.

The observations and scientific data resulting from the pilot study is interpreted using statistical data of variable quality and credibility. The techniques for quantifying damage are assessed and the poster explores how they can be used in a larger series of prospective cross-sectional studies, employing methods found in epidemiology. Applied to cultural heritage, an epidemiological approach can identify how a physical condition or environmentally-driven adverse effect is distributed in museum collections.

This pilot study is part of the Managing Collection Environments Initiative (MCE), a multiyear initiative at the Getty Conservation Institute that addresses a number of compelling research questions and practical issues pertaining to the control and management of collection environments in museums.

### **32. Treatment of a Shattered Bark Basket from Australia**

*Marci Jefcoat Burton*

This poster focuses on the characterization and treatment of an Australian bark basket, and the fabrication of an internal structural support deemed necessary for safe housing. Bark is a material used in the production of composite objects, including painted and framed whole bark baskets, pounded and painted inner bark (i.e., bark cloth), and paintings on sections of whole bark. The most comprehensive published studies relate to the care and treatment of bark cloth and paintings on flattened bark, while a dearth of information exists regarding the treatment of three-dimensional objects made from bark.

An Australian Aboriginal bark basket deaccessioned from a local museum was donated to the UCLA/Getty Conservation of Archaeological and Ethnographic Materials Program. The basket arrived with a broken rim and detached sections, as well as with areas of delamination and splitting in the bark sheet. The extreme warping distortions were causing bark fragments to curl up along the edges and shift out of plane. Treatment of this bark basket required previously unreported steps for humidification and consolidation. Areas of delaminated bark were

consolidated and cracks were adhered with Paraloid™ B-72 in acetone. Different local humidification methods were employed to restore the bark bag to its original shape. Following testing, repairs to hold the bark fragments together were made with toned tissue strips pasted with a mixture of 1:1 Lascaux 360 HV:Lascaux 498 HV acrylic dispersion adhesives. The fragility of the thin bark sheet and the tension required to return the distorted basket back to its original elliptical shape served as two opposing factors that created challenges towards the steps taken in the realignment treatment. Weight could not be applied safely in several locations, most notably the sides. For these tenuous locations, clips and rare-earth magnets were used to provide the force required for the humidified bark to flatten and for mended repair areas to cure. To combat environmental distortions, various flexible materials such as Volara™, Ethafoam™ sheet, silicon tape, Coban™ wrap, and Teflon™ tape were used to provide the tension force required to hold the desired shape of the basket. The last step in treatment involved fabrication of an internal structural support to safely house the bark basket with its fragments and maintain its overall elliptical shape.

### 33. Fatal Attraction: Trials and tribulations in toning rare earth magnets

*Morgan Blei Carbone*

Magnets are one of the many ways that artwork is hung in galleries and institutions today. While the success of magnetic hanging systems is well documented, there is much less information on toning magnets when they are visible on the surface of the displayed object. This poster will illustrate different methods of toning rare earth magnets, from painting and powder coating to encapsulation with fabric and paper. It will also contain the results of an informal survey of conservators that have faced the challenge of camouflaging magnets in display systems. Successes and failures along with samples of magnets will be presented.

### 34. NAGPRA and Conservation: Documenting repatriation materials from the perspective of a conservation professional

*Dr. Elyse Canosa, Dr. Nancy Odegaard*

The Arizona State Museum (ASM) is a nationally recognized leader in executing legislature from the Native American Graves Protection and Repatriation Act (NAGPRA). Since 1986 the museum has repatriated more than 2,000 sets of human remains, 45,000 funerary objects, and 300 objects of cultural patrimony while receiving numerous grants to complete such projects. Prior to tribal repatriation, all objects are documented from various angles during a systematic process implemented at the Arizona State Museum. The final documentation stage is performed by members of the Preservation Division, focusing on understanding the history of the objects from the perspective of a conservation professional. This presentation discusses the established ASM protocol for conservation assessment of NAGPRA materials and how the resulting information is highly beneficial to both the museum and to tribal members. Typical documentation involves evaluating the ways in which objects were previously altered by observing if they were repaired, stabilized, labeled, or sampled. The conservation professional looks for evidence of display or prior destructive analysis while connecting visual assessment information and archived written

documentation. Technical and material examination is also performed on certain objects. For example, ultraviolet illumination is used to identify the presence and types of adhesives and consolidants by fluorescence. Magnification is used to clarify identification markings and labels, and handheld x-ray fluorescence is employed to look for the presence of toxic metal-based pesticides on organic objects. Combined with documentation from photography professionals and archaeological curation, this process provides a comprehensive analysis of all NAGPRA objects and can serve as a model for incorporating conservation into the repatriation process.

### 35. Between the Ephemeral and the Immortal: Considerations about the process of conservation of Ticuna's barkcloth

*Paula Aline Durães Almeida, Edson Tosta Matarezio Filho, Marcia de Almeida Rizzutto, Ana Carolina Delgado Vieira*

Masks representing immortal mythical creatures of the forest are part of female initiation ritual known as the "Festa da Moça Nova" of Ticuna Indians who are currently living in areas between Brazil, Peru and Colombia. This ritual, documented since the nineteenth century, persists in some communities today with few variations. The masks are produced exclusively by men and its use is unique in the rite of passage of girls to adulthood. The masks and the girls share a metamorphic process where at the end of the ritual, both start a new life cycle. However, the ephemerality of these objects is daily witnessed. The preservation of these materials is a race against time, where conservators seek to prolong the life of objects that are produced for a ritual and are often discarded after its use. From the standpoint of its patrimony, we can acknowledge the Museu de Arqueologia e Etnologia (MAE) from University of São Paulo (USP) as the holder of one of the largest, most meaningful and best preserved collections of the Brazilian indigenous cultural heritage.

From 1942 to 1965, the ethnographer-photographer Harald Schultz distinguished as one of the greatest collectors of the indigenous ethnological heritage. The collection of Ticuna's masks and costumes consists of 691 barkcloth objects collected between 1955-1960. During his expeditions, Harald Schultz also recorded their field experiences in photos and films and his production is still of great importance to understand the continuity of processes and cultural resistance. Plant materials which are modified to provide raw materials for the manufacture of objects and the ways in which these objects were used can be elucidated with the information recorded during these expeditions. These photos and videos help us understand the biography of these objects that are lying inside of our storage areas. This poster explores the research project that is currently ongoing at MAE/USP. We identified three types of barkcloth used for making objects in this collection. These materials have different degradation processes. Some masks have preserved its flexibility and integrity, while others has rigidity, brittle fibers, and losses.

To understand the relationship between its composition and intrinsic factors of degradation of these objects, the barkcloths was rated by their conservation status and by the results of X-ray fluorescence (XRF) and pH analysis. We also present here treatments that are carried out such as cleaning, humidification, reshaping and infilling of losses. These actions are performed for several reasons - some have an actively deteriorating process, others need to be prepared

for exhibitions, transport and research. This project also involves the cooperation of an interdisciplinary team to conduct collaborative work with the Ticuna. Through these collaborations, we were able to come up with more effective preservation strategies and we strengthened our relationships with the originators of collections. Join efforts to understand the perspectives of indigenous groups on the conservation of its heritage is one of the objectives of this project.

### 36. Conserving and Interpreting the Mechanical Jacks from the *Queen Anne's Revenge*

*Arianna DiMucci*

This poster presents the in-progress conservation of two mechanical jacks recovered from the early eighteenth century shipwreck *Queen Anne's Revenge* (1718), flagship of the pirate Blackbeard. The jacks are being conserved at the North Carolina Department of Natural and Cultural Resources QAR Lab in Greenville, NC. Their conservation represents a considerable challenge, one that will require the adaptive application of traditional and new technology for archeological iron recovered from a marine environment. Designed to lift or pry apart heavy objects, the jacks were likely part of the ship carpenter's tool kit. Similar jacks have been recovered from the English slave ship *Henrietta Marie* (c.1697-1700), several 1715 Spanish flota sites in Florida, and the Dutch East Indiaman *Hollandia* (1740-1750). These devices worked much like modern hydraulic jacks and consisted of a tapering, slotted rack, one end of which was used for lifting; the other passed through the center of a gearbox containing two or three gears that meshed with and drove the rack. X-rays of the jacks from the *Queen Anne's Revenge* have revealed a large geared wheel with eighteen teeth, the slotted rack, and rack guides which would have held the rack in position as it moved through the gearbox. Previous conservation work on one of the jacks has additionally revealed a number of corrosion-filled cavities where the large gear sits, though the core of the gear appears to be mostly solid. The condition of the iron varies dramatically and both jacks will likely require substantial casting as their conservation progresses given how variable the iron appears to be. While comparative examples provide much needed assistance in piecing together the original appearance of the jacks, such resources are less useful in terms of the specifications of the gearing mechanism, especially given its deteriorated condition. Particular attention will be paid to determine how complex this gearing system is as the gears and their corroded cavities complicate the implementation of a successful conservation strategy. This poster will therefore look at available treatises and illustrations to guide the progression of the conservation of the jacks and will highlight the use of photogrammetry to create a three-dimensional model for exhibit at the North Carolina Maritime Museum. The two jacks will be presented in the context of their day-to-day operations, with a focus on their role in shipboard life in order to augment our current understanding of the *Queen Anne's Revenge*.

### 37. Mending Baskets: Revisiting older approaches with new techniques and inventing better solutions

*Leah Bright, Betsy Burr, Skyler Jenkins, Dr. Nancy Odegaard, Nicole Peters, Marilen Pool, Gina Watkinson*

In 2011, the Arizona State Museum (ASM) basketry collection became an official project of the Save America's Treasures (SAT) program. Known as "Woven Wonders: Basketry Project," this effort addressed the need for new environmentally controlled, secure, unified space for over 35,000 cataloged items that includes arguably the largest and most comprehensive collection of southwest basketry items. Much has been accomplished since the initial SAT grant. Specifically, treatment protocols have been developed, approved, executed, and refined with funding from two IMLS awards. The treatments and storage supports used on basketry at the ASM are based on professional standards and special knowledge gained during the Item-by-Item survey during the multi-year treatment phase of the project. The equipment, supplies and materials for the conservation treatment of the basketry have been tested for use in conservation and are generally available through known distributors within the fields of conservation and collections management. They are considered safe, appropriate, stable, and reversible. The conservation of a research based collection has required conservators to be mindful of: surface sampling protocols; indigenous and historic use, residues, and repairs; and identification of materials and technologies. Mending, the general expression that emphasizes the idea of making something damaged whole and complete is not exactly the correct definition for all basketry conservation treatments. However, the techniques employed seek to address a specific structural problem with minimal introduction of new material or disturbance of original material. This poster illustrates details for many of the successful treatments developed for items in the ethnographic and archaeological collection.

### 38. Guns and Ships: Using dry ice blasting in the conservation of cast iron

*William Hoffman, Laurie King*

This poster presents an assessment of dry ice blasting as a treatment method for the removal paint and corrosion from cast iron objects. Currently, The Batten Conservation Complex (BCC) within The Mariners' Museum and Park, Newport News, VA, is responsible for the conservation of two British naval guns. The guns had originally been aboard vessels scuttled on the York River during the Battle of Yorktown in 1781 and were recovered from the river in 1934 through a partnership between The National Park Service, Newport News Shipbuilding, and The Mariners' Museum and Park. Since recovery, the guns have been painted several times, displayed in both indoor and outdoor settings (often adjacent to a saline/brackish environments), and exposed to fluctuating relative humidity and temperature. In early 2016, it was noticed that the protective paint coatings previously applied to the guns had failed, as well as visible evidence of recent corrosion. From these observations, it was determined that full re-treatment of the objects were necessary which included the removal of the paint coatings and surface corrosion followed by desalination. To avoid using large quantities of solvent and to significantly reduce active mechanical hands-on treatment time, alternate methods of paint and corrosion removal were investigated. Testing was conducted using

both traditional abrasive media blasting using aluminum oxide as well as dry ice blasting following a procedure previously developed within the BCC for cleaning wrought iron. Results of testing identified dry ice blasting as a better choice for cleaning cast iron than aluminum oxide. Further testing was then conducted to develop a cleaning procedure for the removal of paint on the two British guns.

### 39. What Makes the White in White-on-red Ware? A study of two white-on-red Etruscan pithoi

*Lynn Lee, Sara Levin, Jeffrey Maish*

This study characterizes the white decoration and extent of previous restorations of two white-on-red pithoi in the J. Paul Getty Museum collections. Produced during the latter part of the 7th c. B.C., white-on-red wares were short-lived but popular during the Orientalizing period. One of the Getty's pithoi contains an early depiction of the blinding of Polyphemos from the *Odyssey*, making it an important initial example of a classical motif. However, some unusual details in the illustration prompted the investigation of the media to define any modern restorations that would obscure the original. The second white-on-red pithos from the collection is covered in geometric decoration and was studied simultaneously to support the broader understanding of the white media. The era of production of the ceramic was confirmed with thermoluminescence (TL) dating, but distinguishing restored decoration from original was challenging due to an overall coating and the nature of over-paint. Restorations lacked significant amounts of historic or modern white colorants, such as lead white or titanium white, that were commonly used to mimic slip in the nineteenth and twentieth centuries. Although technical studies of white-on-red wares are few, recent research performed by other institutions has identified the white decoration as a kaolin slip. A combination of analytical techniques was used in the current study including ultraviolet illumination (UV-VIS fluorescence), x-ray fluorescence (XRF), Fourier transform infrared (FTIR), Raman spectroscopy and scanning electron microscopy-energy dispersive spectroscopy (SEM-EDS). Results indicate the likely presence of kaolin and gypsum in the Polyphemos pithos, but identified calcium carbonate as the dominant colorant in the geometric pithos. These findings indicate that the media may not have been fired-on, as is suggested in other studies, or is highly masked by modern restorations. The present work addresses the challenge of identifying a kaolin-based (alumino-silicate) medium on top of a ceramic substrate, with modern over-paint and/or overall coatings present, and defining restorations that use pigments such as calcium carbonate that were also available in ancient contexts. Archaeological details, such as manganese staining, and visual comparisons with contemporaneous objects provide additional clues about the original white design.

### 40. Investigation of Gold Residues on Glazed Renaissance Sculpture: Gilding the virtues

*Abigail Hykin, Casey Mallinckrodt*

Glazed terracotta figures depicting the Christian virtues Faith and Hope by Benedetto Buglioni (1459-1521) were loaned to the Museum of Fine Art, Boston (MFA) from a private collector for inclusion in the exhibition "Della Robbia: Sculpting with Color in Renaissance Florence." The figures are glazed white with apparent "modern" gilding on the halos, as well as on the base of the chalice

held by Faith. Conservation was undertaken at the MFA revealing extensive gilding residues over the surfaces (as well as residues of white lead and of gesso-like layers) which prompted an in-depth research project to investigate the decorative patterns that originally covered the surfaces of these sculptures. This investigation contributed significantly to understanding the history and original appearance of the sculptures. Gilding remains and residual patterns were documented and photographed with both short and long wave UV light for possible enhancement of remaining gilding adhesive. The gilding residues and waxy green exudates on the "modern" gilding on Faith were sampled for analysis with SEM-EDS, Fourier Transform Infrared Spectroscopy (FT-IR), and X-Ray Fluorescence Spectroscopy (XRF) by the MFA's Research Scientists. Samples of the modern gilding on the halos of both Faith and Hope were prepared as cross-sections and evaluated to identify the materials, distinct layers or applications of gilding, and differences or similarities between gilding on the two sculptures. Museum curators were consulted about prevalence of gilding on glazed ceramic and in artwork of the Renaissance and provided literature about textiles produced in Florence before and during the period of the Buglioni workshop. Access was provided to the museum's sample collection of Florentine Renaissance textiles in order to compare patterns evident in the gilding residues to textiles manufactured at the time the sculptures were made. Results of the investigation provided substantial evidence that elaborate patterned gilding covered the "clothing" possibly resembling textiles being produced in Renaissance Florence, which was a center of textile production noted for embroidery of gold thread on velvet. In addition, the research confirmed that the current dominant gilding on both of the halos is not original, but obscures original gilding on the halos of both figures. The original gilding was applied with a thin adhesive and fired at a very low temperature, but without bole or a substrate layer. The later 19th or 20th century "gilding" on Hope proved to be brass paint and on Faith gold leaf over a substrate. Prussian blue was identified in a sample of the green exudates on the "modern" halo gilding from the figure of Faith, providing a terminus post quem of the early 1800s. These variations also indicate the sculptures were not paired throughout their history.

### 41. The Emergence of the Science of Botany: Preservation of personal herbaria

*Olga Souza Marder, Kelsey Osborn Miller, and Catherine Stephens*

This paper will investigate the preservation issues and treatment challenges posed by the LuEsther T. Mertz Library's Exsiccated Specimens Collection. This collection is comprised of over one hundred herbaria, dating primarily from the 19th century. This diverse group of items is made up of many individual herbaria: systematically arranged collections of dried plant specimens that were gathered, pressed, organized and secured to a support material. In most cases, the specimens were adhered to the pages of a blank book or to paper sheets and were identified by each collector with varying degrees of accuracy. These herbaria may not include all required plant parts and/or associated data to make them suitable for scientific study as are those found in the New York Botanical Garden's William and Lynda Steere Herbarium. In many botanical libraries, herbaria such as these have been relegated to a secondary role in spite of their enormous historical and artifactual value. They may shed light on many facets of Western interest in botany and the popular appreciation of plants.

The Mertz Library's Exsiccated Specimens Collection includes the personal herbarium of the prominent American botanist John Torrey, botanical souvenir books of 19th century tourism, and many sentimental volumes of dried flowers from the Victorian era. The earliest item in the collection is the *Catalogus Plantarum Flore*, compiled between 1660 and 1753, which is a unique combination of plant specimens, manuscripts, collages and illustrations. In conjunction with the cataloging of this collection, the Conservation team carried out an item-by-item survey to record the characteristics and current conditions of each object in the collection in order to plan for rehousing and for possible conservation treatment. The Conservation team also worked with Garden's botanists to assess the scientific contents of many of these items as well as to review samples of the scientific herbaria held by the Garden's Steere Herbarium.

The Exsiccated Specimens Collection presents many housing and treatment difficulties because the items take many different forms, each needing special considerations. Various methods were used to attach specimens to their support. These methods included gluing, sewing and tacking specimens down with strips of gummed paper. There are even more variations between the herbaria when it comes to style of bindings. There are homemade pamphlet-sewn booklets, stationer's blank books, plant collecting albums, photo albums, loose-leaf portfolios and some specimens are mounted between glass plates. All of these items are meant to display and preserve old and fragile specimens of dried plants. For this reason, the collection is particularly susceptible to damage from insects, humidity, mold, and poor handling. The bound herbaria, for instance, represent a major challenge and ethical dilemma for conservators and curators regarding their access and digitization. This paper will discuss the findings of the collection survey, preservation concerns and conservation treatment. It will provide a brief historical overview of the practice of collecting and preserving dried plant specimens as well as examples of scientific plant specimens held by the Garden's Steere Herbarium.

#### 42. Treatment and Reconstruction of a Badly Damaged Hopi Katsina Doll Made of Gourd

*Hayley Monroe*

This poster will display the step by step treatment of an unusual Hopi Katsina doll - Katsina is the Hopi spelling of the more common Kachina. These dolls are not only associated with the Hopi, but also the Zuni and Pueblo communities of the American Southwest. The brightly painted figures are usually carved from wood. This treatment addressed a badly damaged and privately owned Katsina which was brought to the UCLA/Getty conservation lab for treatment. The piece, depicting the eagle spirit or Kwaakatsina, was made in 1995 by the Hopi artist Ferrill Nequatewa, best known for making traditional gourd rattles. Like his rattles, this Katsina is composed primarily of hollow gourd. In this case two, one for the body and one for the head. The figure's limbs are made from a combination of wooden pieces and are attached with both adhesive and wooden dowels. There are additional fur and feather details on the head and around the neck. The figure is brightly painted with acrylics. The gourd which makes up the body of this Katsina is particularly thin-walled and fragile, and as a result it suffered the majority of the damage when the Katsina was broken into pieces. When the limbs and head were broken free from the body they took with them significant portions of the gourd wall. This greatly complicated their reattachment as the joints between the pieces of gourd were extremely

thin and unable to safely support the weight of the arms on their own. Long cracks propagating across the gourd had caused it to twist slightly, making alignment and stabilization less straightforward. While these two tasks occupied the bulk of the treatment, other condition issues addressed include cleaning and minor repairs to some of the feathers as well as thorough mechanical cleaning of the fur collar which upon examination was found to contain the remains of a past insect infestation. Particular challenges during this treatment included the repair and stabilization of cracks in the gourd body while retaining flexibility and avoiding rigidity; reattachment and reinforcement of the arms which required an internal armature to take the weight off the repaired gourd walls which otherwise were the only points of attachment; stabilization of the base to solve an existing wobble which was endangering the already top heavy figure; and finally the visual reintegration of the most distracting cracks in the Katsina body.

#### 43. Exploring Methods for Determining the Age of Clock Mainsprings

*Mostyn Gale*

Many mechanical clocks utilize mainsprings made of steel as their power source. Through normal use and ageing these mainsprings may break or become weak which leads to their replacement. In essence, mainsprings have a finite life and are generally treated by clockmakers as a consumable part of the clock. As a result, historical data is lost when old mainsprings are discarded. Today, an original mainspring in an 18th century clock is rare. A survey of nearly seventy horologists demonstrated that 90% of what are perceived to be weak mainsprings are replaced during repairs or restoration projects. The survey also showed that maintaining a clock in working condition is amongst the most important goals for horologists. This goal stands in opposition to widely accepted conservation practice—maintaining historical integrity with minimal intervention—a functioning clock is destroying itself through use and normal wear. For the conservator, this raises the question of whether a mainspring can legitimately be treated as a consumable, or should be preserved as part of the historic integrity of the clock above all other factors. A literature search indicated that published articles relating to conservation of clock movements are few, and those relating to mainsprings—particularly determination of the age of a mainspring—even fewer to non-existent. The goal of this research is to provide a guide for determining the age of a mainspring so that a more informed decision can be made about its retention or replacement. An historical study of the mainspring manufacturing process led to the definition of four broad eras that may be differentiated by visual and analytical techniques. An initial study of twenty mainsprings was conducted using visual inspection, microscopy, and x-ray fluorescence techniques. The test results demonstrated that the general date of a mainspring can be determined. A case study has been used to demonstrate issues in an actual clock and resulted in the determination that its mainspring was most likely original to the clock. The work carried out points the way for further study, testing, and analysis.

#### 44. Applying Fills to Losses in a Flexible Polyurethane Foam Chair at the Museum of Modern Art

*Alexandra Nichols*

This poster will focus on applying fills to losses in the Torneraj Armchair, a coated flexible polyurethane foam chair in the collection of the Museum of Modern Art in New York City. While there is extensive literature on the consolidation of polyurethane foam artworks, there is very little information on creating fills for soft polyurethane foam sculptures. The Torneraj Armchair had sustained large losses to the foam and coating due to degradation of the polyurethane foam substrate due to photo-oxidation. Scientific analyses of the foam substrate and pigmented coating for the chair were conducted using polarized light microscopy and FTIR to determine appropriate adhesives and solvents for treatment of the chair. For this treatment, new polyurethane foam was selected as the fill material to retain properties of the original foam substrate. The use of liquid nitrogen to freeze soft polyurethane foam so that it can be cut and shaped into smaller sizes and grains will be described. This poster explores methodology for testing various fill adhesives using mock-ups, and describes how fills can be applied and inpainted to restore the overall appearance of foam artworks.

#### 45. The USS Monitor Gun Carriages: Treatment steps and innovations for the conservation of complex composite artifacts

*William Hoffman, Elsa Sangouard, Kathleen M. Sullivan*

The *USS Monitor* was the first ironclad ship built by the Union Navy for use in the American Civil War, and with its construction, ushered in a change in the nature of naval warfare and shipbuilding. It featured the world's first revolving gun turret on a ship which was armed with two XI-inch Dahlgren shell guns. Each gun rested on a specially designed gun carriage, which consisted of about 300 individual component parts made of wood, copper alloy, wrought iron, and cast iron. Recovered in 2002, both carriages are housed at The Mariners' Museum's Batten Conservation Laboratory complex, and are undergoing active conservation. No treatment exists to preserve copper alloy, iron, and wood simultaneously so the carriages must be disassembled for treatment. The complexity of the artifacts as well as the magnitude of the task led to innovative conservation methods in order to disassemble and treat the objects safely. This poster discusses the successive treatment phases of these composite artifacts, the innovations used, their successes as well as their restrictions.

#### 46. Ancient Figures Become an English Pleasure

*Gerri Strickler*

A restored ancient sculpture within the Museum of Fine Arts, Boston, was recently transferred from the Art of the Ancient World to the Art of Europe. The sculpture, which was last on view in 2002, is planned for exhibition in a newly reinstalled European Decorative Arts gallery (December 2016), which has prompted the Object Conservation Department to reassess its condition and further document the restoration. The sculpture was given to the MFA in 1968 and understood to be a pastiche containing a large fragment of 1st or 2nd century Roman sculpture. The missing compositional elements were added in the 18th

century, during a period of time when restorations of ancient statuary fragments were commissioned by European nobility or from dealers who sold them. This sculpture was in the collection of James Hugh Smith Barry, Cheshire, England, who had acquired Greek and Roman statuary in the late 18th century.

In recent years, the sculpture has been reconsidered as an 18th-century work of art, which in turn provides a new opportunity for its reinterpretation to the Museum public. The ancient stone fragment of two torsos has twelve added elements including the heads, some limbs, and the drapery, which complete the reconstruction. It stands one meter tall and depicts the figures Dionysos and Maenad walking with arms around one another. Two similar examples of this group are located in Antikensammlung of the Berlin State Museums and the National Archaeological Museum in Athens, which suggests that the MFA fragment may have been re-cut during the restoration to Dionysos from the god Priapos, characterized by a large erect penis, notably absent from the MFA version.

The conservation assessment has involved examination of the surfaces under magnification in order to compare the characteristics of the ancient marble to the restorations and areas associated with re-cutting. Visible surface characteristics associated with re-cutting during restoration appear to have resulted from the removal of calcareous deposits, integration of losses or damage, and modifications to integrate added components. Significant stylistic changes are thought to have been made to the chest, torso, and right leg of the male, and the right chest of the female, in order to reduce the volume of his body, creating more slender figures. Though there is evidence of re-cutting along the inside of the male's right leg and along the drapery, it is difficult to determine with certainty that the figure is indeed missing an erect phallus. The discussions around the stability and aesthetics of the 18th-century restorations have been and continue to be compelling. To what extent should we re-address the restoration without actually changing the restoration? Given the important context of the sculpture being an 18th-century artwork, to what extent should the restoration materials be preserved? These discussions remain in process until conservation is complete this December.

#### 47. Case Study of Regalrez 1126 Used as an Adhesive and Consolidant in the Conservation Treatment of an 18th Century Chinese Amber Cup at The Metropolitan Museum of Art

*Tong Tong*

This poster discusses the method of using Regalrez 1126 as an adhesive and a consolidant in the conservation of amber objects. In paintings and furniture conservation, Regalrez 1126 was commonly used as a material for consolidating degraded surface coating without the need for removing most of the original coating material. Since Regalrez 1126 is a non-polar, hydrocarbon resin with low-molecular weight, it is compatible with most natural resin that were used historically as varnishes and furniture coating materials, such as dammar, shellac and lacquer. It infills the losses, saturates and restores the gloss and durability of varnishes and coatings made of natural resins.

However, case studies of Regalrez 1126 used as a primary adhesive for repairing amber objects were yet to be reported. A previous research initiated by Linda Lin demonstrated preliminary exploration on the potential of Regalrez 1126 replacing Paraloid B72 as both an adhesive and a consolidant in the conservation of the Asian amber collection at

the Metropolitan Museum of Art (MMA). Regalrez 1126 is dissolvable in petroleum benzene and mineral spirits, which are the two organic solvents with low –polarity and will not interfere with soluble components within the amber. In addition, the refractive index of Regalrez 1126 is comparable to that of amber which is an important property, considering the translucent quality of amber objects. In the long term, Regalrez 1126 does not cross-link and remains stable in a controlled museum environment.

In this case study, Regalrez 1126 was used as the recommended adhesive on an 18th century Chinese amber cup, which belongs to the Asian Art Collection at the MMA. The amber cup was broken into several pieces, and significant repairs were required for the conservation treatment. Amber is a natural resin with durability, but can become brittle and fragile after years of degradation. The edges at the breakages were thin and brittle, and needed consolidation prior to adhesion in order to avoid further damage caused by handling. Regalrez 1126 was used for initial consolidation on the breakages, and the primary adhesive for rebonding the pieces back together. Its transparency and viscosity are ideal for amber objects since it does not tend to penetrate through the craquelures or efface the characteristic crazing pattern of the amber. The treatment can be easily reversed by applying petroleum benzene to the joints, thus the process of removing residue or excess with solvents should be minimized and only be done if it is necessary.

#### 48. Practical Solutions to The Challenges of Documenting Large-Scale Objects

Jessica Walthew

The challenges of documenting large objects sometimes test the limits of our space, equipment, and patience. The physical limitations imposed by our photography set-ups and the size and condition of the objects themselves constrain our ability to achieve acceptable overall photos. This talk will address problems encountered during photographing and stitching photos of large objects and the practical solutions developed to overcome them. It will also discuss the reasons behind the success and failure of commonly used practices. Documentation is one of the universal responsibilities for conservators in all specialties, who record a variety of information on the condition of objects, technical details, and treatment we perform. Along with hand-annotated sketches and photographs, digital technologies provide conservators with new and exciting capabilities, allowing us to stitch photos, created layered digital annotated documents, and make 3D models. Technical imaging techniques like Reflectance Transformation Imaging (RTI) and multispectral imaging open up yet more possibilities. Some of these techniques have been readily adopted by conservators, while others are more difficult to implement, requiring additional training and special equipment. Nonetheless, conservators today face many of the same challenges we did when documentation was analog: digital tools and technologies have not (yet) eliminated the need for creative problem solving in both the capture and processing phases. After establishing some of the goals of documentation photography, the talk will work towards an understanding of the adjustments we need to make to the “ideal” hypothetical photography set up in order to achieve the best results possible when working in less-than-ideal conditions. Examples feature textiles with patterned surfaces, and three-dimensional sculptures with issues of access and lighting. The problems I will focus on relate to textiles and objects conservation, but could be equally applicable to architectural documentation or large-scale paintings and paper

artworks as well. How do you accommodate unavoidable distortion caused by the camera angle and lens? How can you include registration markers to more easily align photographs for stitching? What other tools (panorama stitchers, photogrammetry software) should we add to our toolkit for conservation documentation? Illustrated examples will demonstrate useful modifications to standard practice that can help ease the process of stitching photographs together, and explain several cautionary tales of approaches and shortcuts that did not work out. Rather than focusing on procedural details and proposing a one-size-fits-all solution, this discussion will center on what types of problems we frequently encounter and how to develop strategies for working around them. Since documentation is such a key responsibility of professional conservation practice, it's important to recognize that a flexible approach may be needed to ensure we are focusing on the bigger picture: providing useful information for now and the future.

#### 49. *Rutabaga: In: The Sky* – Creative Solutions to Modern Treatment Problems

Stephanie Barnes, Craig Huzway, Antje Neumann, Jia-sun Tsang

*Rutabaga: In: The Sky* (1978-79) by American artist McArthur Binion (b. 1946) is an abstract minimalist work in oil stick and Dixon Wax crayon, on a large ball-grained aluminum lithographic plate. The piece was acquired by the Smithsonian's National Museum of African American History and Culture (NMAAHC) in 2014, and is currently on display in the Visual Arts (VA) gallery as part of the museum's inaugural exhibit, which opened in the fall of 2016. Before arriving at NMAAHC in 2014, *Rutabaga: In: The Sky* was damaged as a result of an impact sustained during transit. This impact to the front of the work left a large dent in the lithographic plate. Considering the extent of the structural damage, damage to the soft crayon media was relatively minor; however, the impact initiated the failure of the epoxy glue which secured the thin, flexible support to its aluminum strainer. Conservation treatment was essential to stabilize the work in preparation for exhibit. The conservation of Binion's *Rutabaga: In: The Sky* included consultation with the artist, materials testing and analysis, and the collaboration of paintings conservators, objects conservators, and exhibits specialists from three Smithsonian institutions. This collaboration allowed us to devise an innovative and creative treatment solution, which respects the artist's intent, and will safely support the artwork for NMAAHC's inaugural exhibit and beyond. Many of McArthur Binion's contemporaneous works employ the same materials and methods, and are therefore at risk for similar damage – The thin lithographic plates can be bent if not adequately supported, and the soft oil and crayon media employed by the artist is vulnerable to pressure, abrasion, heat, and can easily imbibe dirt and dust. Lessons learned from the study and treatment of this work can be used to inform the conservation - both interventive and preventive - of other works by the artist, or those of by other artists employing similar materials and techniques.

## 50. The Sharp End of Conservation: Reintroducing paint to a mid-nineteenth century American stained-glass window

*Drew Anderson, Amanda Chau*

A recent examination and treatment of a mid-19th century, American, stained-glass, church window owned by The Metropolitan Museum of Art presented an ideal opportunity to relook at past paint restoration techniques and develop an innovative alternative that not only restores aesthetic legibility, but also avoids conservation concerns that arise from other techniques. The relatively unknown artist of the decorative window, Henry E. Sharp, heavily employs stenciled designs on nearly every pane. Thus, the patterns are a crucial component in how the window is viewed as a whole as well as understanding his style and technique especially during this early period of American stained-glass history, in which few windows were signed or dated, and many were destroyed or lost. However, due to inherent vice and a lack of protection from pollution and the elements for over 150 years, the window suffered from severe paint loss that altered the readability of the window. Therefore, restoring aesthetic legibility was a paramount goal of the treatment. The paint reintroduction method is based on a concept and treatment by Keith Barley, in which a mixture of glass paint, oil based gold size, and turpentine was brushed onto the back side of a figure's face in order to bring forth the imagery of the area that suffered from paint loss. This project's treatment on the Sharp window implements Barley's concept, tests its application on a larger scale, and integrates traditional glass painting, printmaking, and silk screening processes. Through this innovative method, the paint is reintroduced in a manner that is faithful to the artist's stencil patterns, clarifies the artist's designs, is stable in an environmentally controlled interior setting, and is entirely reversible. Furthermore, this alternative method maintains the original materials and avoids possible complications of trapped moisture or stress from additional weight that can occur with back plating, a traditional paint reintroduction technique. Even in its early stages of development, this project's paint reintroduction method has proved overall effective in restoring aesthetic legibility and provides a promising alternative that should be further considered and explored for other windows facing similar condition issues.

## 51. Five Van Goghs

*Thomas Heller*

- MANNER OF VAN GOGH PAINTING Similar to 1886 Paris Floral JH1135 (photo). Similar to Dutch colored sketch JH726 (photo).
- FOUR HIDDEN PAINTINGS: 3 Described in V.G.'s letters. 1 is signed 'Vincent'. 1 Matches a V.G. Painting JH922.
- FOUR VISIBLE IN X-RAY AND PAINT X-ray photo Tracings photos of four hidden scenes with letter quotes, titles, dates.
- DISCOVERY PROCESS Brief description of research discoveries and dates over 5 years.
- IMPORTANT DISCOVERIES Vincent's First painting that he said begins his career as a painter. " " repetition. " " reuse of canvas. Record Five Van Gogh paintings on one canvas. Painted over Five years-half his career as a painter. " in four locations three in Holland and one in Paris. Three scenes reflect his great respect for his father. A very special painting to Vincent.

## 52. Alternative Methodology for Traditional Interventions: Loose lining in colonials paintings

*Damasia Gallegos, Ana Morales, Dolores González Pondal*

Lining treatments used in the conservation-restoration field include several options and can be classified according to the adhesive used. Traditional methods include those based on glue-starch and wax-resin, while those using synthetic adhesives are considered alternative methods. The appearance of new materials and mechanical equipment like the low-pressure table expanded the possibilities of intervention. Nevertheless lining is always a structural change and an invasive treatment for the paintings. This poster describes research carried out by an interdisciplinary team of conservators, historians and chemists from the Centro TAREA, Instituto de Investigaciones sobre Patrimonio Cultural of the Universidad Nacional de San Martín that elucidated fundamental aspects of paintings from the South American colonial period, deteriorated but with an important documentary value. Centro TAREA has a long tradition of restoring colonial paintings. During twenty years, more than 400 paintings were treated. Traditional methods were preferred to reinforce the structure in the cases where lining was required. The fabric weakness and the large size of the canvas, usually demands invasive intervention in colonial paintings to guarantee the integrity of the piece. In the cases presented here, minimal intervention criteria were applied and the loose lining method used proved to be the most suitable alternative lining for these particular situations. The structures were reinforced employing a completely reversible treatment, choosing the so-called alternative lining: loose lining. The fundamental characteristic of this procedure is its easy removal because in this system the use of adhesive, heat or humidity are avoided. On the other hand, in traditional lining methods, texture and color saturation of the painting usually suffer alteration. Although the loose lining is considered an alternative treatment for particular cases, we find the possibility of re-treatability in these colonial paintings meant an essential quality of this lining method.

## 53. Chinese Handscrolls: A systematic approach to treatment solutions for common problems

*Xiangmei Gu, Grace Jan*

At the Freer Gallery of Art and Arthur M. Sackler Gallery, Smithsonian Institution, Chinese handscrolls compose a large portion of the Chinese painting collection. Exhibition rotations and scholar visits generate steady demand for regular access to this large collection. The sheer number, size and structural complexity of these objects have made conservation treatment a challenge for conservators. This paper will outline the systematic approach conservators have developed to address common problems and the treatment solutions associated with this part of the Chinese painting collection. Among the various formats for Chinese painting and calligraphy, which include hanging scrolls, folding albums, framed images and fans, handscrolls are one of the most important. Handscrolls are a complex laminate structure, composed of multiple sections of painted paper or silk supports that are joined together and lined with additional layers of paper. The quality, selection and use of materials are critical to the overall balance and long-term stability of this format. The rolled format allows a long section of painting to be easily handled, transported and stored. Although designed for convenience, repeated handling often results

in wear and damage to handscrolls. The most common condition problems include, delaminating support layers, sharp creases, splits and wear. Xiangmei Gu, senior Chinese painting conservator at the Freer Sackler, has successfully implemented a decision-making process that adapts a range of techniques and treatment options appropriate for this diversity of issues. This decision-making process involves: (1) identification of condition problems; (2) ranking of problems by severity and fragility; and (3) prioritization of solutions to stabilize and ensure the safety of the object. Considerations include selection and use of appropriate materials and the history of the object format. Within this process, the degree and severity of issues dictates whether traditional techniques of complete remounting should be used or if more conservative approaches, including partial remounting or minor treatment, are more appropriate in circumstances when minor, localized treatment may be sufficient and safer for the painting. For example, built on fundamental mounting practices, partial remounting may include reusing or replacing cover silks, repairing major tears, compensating for unevenness and imbalance in the mounting structure, flattening and replacing the final backing layer. This condition assessment and treatment system is effective for the management and conservation of these repeatedly handled objects. It successfully classifies intervention—minor treatment, partial or complete remounting—based on both the handscroll's needs and the conservator's resources. In institutions where conservators are less familiar with traditional mounting practices and face limited resources, this treatment system can have widespread application.

#### **54. Blue Period?: Analysis muddies Tintoretto attribution and working practice**

*Dr. Amanda J. Norbutus, Lourdes Nunez*

Jacopo Robusti, better known as Tintoretto, was a prominent figure in the school of Venetian Renaissance art. A contemporary of Titian, Tintoretto became known for pushing boundaries and creating a dichotomy of works whose quality depended upon the speed at which he painted. Art historians have made the life of Tintoretto easily accessible with the amount of literature available, yet the limited information gathered through scientific examination of his works by Joyce Plesters is well documented. However, much of that work pre-dates the use of several modern analytical methods, such as x-ray fluorescence spectroscopy and XRF mapping to analyze artworks. As such, two Tintoretto's exhibited at the Cornell Fine Arts Museum (CFAM, Winter Park, FL), "Portrait of a Gentleman in Armor" (c. 1580) and "Portrait of a Venetian Senator" (c. 1575), were analyzed to better understand which working methods and materials best embodied a "Tintoretto." Research of the two CFAM portraits started with an in-depth analysis of the paintings' accession history, conservation records, and various catalog entries prior to non-destructive x-ray fluorescence spectroscopy (XRF) and infrared reflectography (IRR) analysis. Photomicrographs from a 1990 conservation treatment raised more questions than anticipated in the initial stages of research. In the photographs, a peculiar bright blue under layer was visible through several areas of loss in the "Armor" portrait. Combined with significant differences in the quality of brushstrokes between the two works, the curator began to question the true authorship of the "Portrait of a Gentleman in Armor." The investigation turned from an analysis of Tintoretto's materials and methods to an attempt to better inform the curatorial staff with regards to the attribution discussion: was the "Armor" portrait painted by (1) the currently attributed

Jacopo Tintoretto, (2) Tintoretto's workshop, or (3) Tintoretto's son, Domenico? Non-destructive analysis, including XRF-mapping and IRR, did not answer the prevailing question, but instead prompted further queries. A strong copper signal was detected throughout most of the "Armor" portrait, instead of select areas as earlier hypothesized. The copper XRF signal, in combination with the mystery blue paint visible in the conservation photographs, may indicate a reused canvas or the presence of a second painting under the current painting. Several microscopic samples from the "Armor" portrait were examined under visible, ultraviolet and polarized light microscopy. Select samples were further imaged using scanning electron microscopy (SEM), allowed for the elucidation of the anatomy of the painting. Recent approval by the owners of the "Senator" portrait will allow for samples to be removed for the other Tintoretto for microscopic and spectroscopic analysis, for comparison with the "Armor" data. The paper will present the findings of this Tintoretto investigation, emphasizing the evidence to be culled from well kept curatorial and conservation records, as well as discussing the information gathered from non-destructive and micro-destructive analytical methods.

#### **55. Innovation of an Early Unknown Pioneer: Steam jennies, long arms, and battle flags**

*Ann Frisina*

An early pioneer from St. Paul, MN, Tom Welter, treated many battle flags between 1964 and 1982. While his work is known by many veterans in the textile conservation community, the documentation of his historic private practice and his influence on modern-day techniques have not been examined until now.

Welter was an Army Air Corp pilot in both WWII and Korea, who went on to be a sign painter and custom display specialist at Montgomery Ward's department store. After a two-day tutorial from Katherine Scott in 1964, he developed a method to encapsulate battle flags. Welter went on to use his method of consolidation for many years. Once the treatment was completed, a flag was able to hang from its staff for long-term exhibition.

During the 18 years that Welter dedicated to conserving battle flags, he frequently used and or modified every day household items and created extraordinary one-of-a-kind equipment. Within this paper I will review the historical equipment and machinery Welter developed during his 18year career. By examining former treatments, journal notes, documentation, and actual equipment, I will show how Welter's treatment procedures evolved as he employed creative problem solving to preserving battle flags throughout the country.

#### **56. From Scroll to Panel and Back Again: Changing formats and the challenges they pose when remounting Asian paintings**

*Sara Ribbans*

This paper will discuss the examination of Asian paintings to determine if the mounting format has been changed and the questions that arise when approaching a new remounting treatment. Asian paintings are laminate structures mounted in scroll, screen, album and panel formats. These structures are constructed with the intention that they be remounted as they age, renewing the mounting and repairing

the painting as necessary. While the current practice is to preserve as much of the old mounting as possible, this has not always been the case and there are many examples of paintings changing format, such as a set of poem cards by Tawaraya Sōtatsu that are found in collections throughout the world mounted variously as hanging scrolls and albums. Common forms of damage specific to each format can often be used to help determine whether a painting may have been mounted differently in the past. Discovering these changes begs the question of whether to return the painting to a previous mounting style or keep the current mounting. The answer to this question is not always clear as one format may be historically accurate while the other is a part of the painting's history. The possible approaches to this question are demonstrated through examples of paintings in the Cleveland Museum of Art's collection that have changed format. While there is no one answer that covers all cases, this paper will provide ways in which to examine Asian paintings for format changes and a starting point for discussions when considering remounting Asian paintings in other collections.

### 57. Improvements in 2D X-Radiography and Volumetric X-Ray Tomosynthesis

*Dr. Dan Boye*

Use of x-ray imaging permeates the process of art and artifact care and conservation. As with any technology-based tool, advances in hardware and software capabilities bring about refinement and expansion in existing areas as well as enabling new areas of application. For instance, there are two main methods of radiography, Computed Radiography (CR) and Digital Radiography (DR). Each method has practical advantages and limitations. One limitation of DR has been that conventional DR plates have not been sensitive to x-ray energies below 40kVp. By incorporating new carbon fiber tops and locating low-noise electronics away from the detection region, the detection threshold can be lowered to ~15kVp. The improvement in low energy detection allows us to present 2D x-ray images taken with a DR plate of laid lines, legible text and watermarks on paper, colorants on maps, as well as changes in wood grain density and weave configurations of cloth. Possessing 3-dimensional knowledge of the condition and construction of an object can provide the conservator with interesting and even essential information. We will describe a newly available volumetric x-ray tomosynthesis technique that uses a series of 2D radiographs taken from different perspectives varying two degrees of angular freedom. Each radiograph contains the entire volume to be examined so no interpolation between slices is necessary as in computed axial tomography. The volume reconstruction software requires that configuration details for each input image be known. Consequently, highly accurate and precise measurements of image features can be made easily. We have used the technology with a variety of sources and DR plates and have recently employed CR systems commonly found at museums and non-destructive testing laboratories. Because of the relatively small amount of data gathered, the user can scroll the focal plane through an object along any axis in near real time with just a typical laptop computer. The hardware is portable so that exams can be made within an x-ray vault, out on the museum floor or in the field. The software output in the form of image stacks interfaces readily with 3D printing and virtual reality technologies. At last year's AIC conference, we showed how this volumetric technique could be applied in examining the paint layers of paintings on wood or canvas while suppressing contributions to the view caused by supporting understructures in the form of cribbing

or stretcher bars. Input images of paper with double-sided print can now be examined by volumetric tomosynthesis by capitalizing on the improvements in the DR plates described above. We will show that text can be read and paper thickness measured by setting the focal plane to each of the two sides of the paper. These achievements are possible even when the paper is placed within an envelope.

### 58. TMI? Non-destructive Redacting Options for Archival Collections

*Erin Hammeke*

Various methods for redacting and restricting access to sensitive information have been employed in the fields of Law, Records Management, and Archival Processing. Marking, stamping, or destroying originals; creating multiple marked photocopies; and restricting access are some of the approaches currently in use. Current practices can be wasteful, damaging, and/or time-consuming, and are especially poor solutions for certain types of materials. In addition, many of these methods are in conflict with core values of the Library and Archives Conservation profession, including reversibility and providing preservation of and access to original material. Duke University Library conservators have tested various adhesives and papers in the development of an adhesive-coated paper redacting patch that is non-destructive and reversible in the conservation lab but not in the reading room. These Lascaux-coated papers are heat-activated and have been found to be effective and easy to prepare, apply, and reverse, in the event that information no longer needs redacting. Multiple case studies of collections at Duke that warranted alternate redaction strategies as well as housing solutions will be discussed.

### 59. Cutting Edge Technologies in Non-invasive Organic Analytical Techniques

*Amanda Jones*

When studying and conserving historical objects, there are many considerations taken into account to determine necessary analyses, especially the capability for non-invasive testing. These analyses enhance the understanding of and inform treatments that successfully preserve an object. The decisions for testing can be difficult when faced with the dilemma of sampling for analysis and the ethics of preserving an object's integrity. Recent advances in heritage science have focused on improving the availability and capabilities of minimally destructive, non-destructive, or non-contact equipment for the conservation community, most successfully for testing inorganic materials. Advancing the technology of equipment for studying organic materials has proven to be more difficult, but newer attachments and portable options are now available with comparable resolutions and spot sizes that could prove valuable for accurately testing organic materials with microscopic to no damage to the object. In literature, Fourier Transform Infrared Spectroscopy (FTIR) and Raman setups are the main forms of analytical techniques used for identifying organic compounds. They have been utilized quite extensively for various media, but when identifying media on paper and parchment, spectra are often swamped with peaks correlating to cellulose that make it difficult to characterize any coating that might be found on the surface, including sizing, ink or colorant. In response to this, a study was completed to test currently available non-invasive equipment to confirm they have

the same quality of results as micro-analytical or destructive testing. This study compares the Da Vinci Arm FTIR attachment and a portable FTIR to a selection of standard FTIR and Raman set-ups and attachments to explore the sensitivity of the chosen non-invasive and portable techniques in order to identify and characterize types of coatings found on paper and parchment substrates. The samples were also analyzed to compare the efficacy of non-invasive testing of artificially aged samples over time and the clarity of spectra when looking at the degradation of paper and parchment. Samples were prepared applying various coatings commonly used in different thicknesses to a variety of paper and parchment substrate, as well as uncoated control samples. A selection were artificially aged and tested at predetermined points in the aging process to monitor degradation and assess changes in both substrate and media.

### 60. Conservation and Art Historical Data goes Digital at the Art Institute of Chicago

*Kaslyne O'Connor, Ariel Pate, Sylvie Pénichon*

The 244 photographs that make up a portion of the Alfred Stieglitz Collection at the Art Institute of Chicago are among the treasures of the museum's collection. Yet, unlike the equivalent collections at the National Gallery of Art or the Metropolitan Museum of Art, this collection of photographs had never been systematically researched or presented as a whole. This changed in 2016, with the launch of the Alfred Stieglitz Collection: Photographs website (<http://media.artic.edu/stieglitz>), an innovative approach to presenting a sub-section of the museum's holdings. Collaboration between digital, conservation and curatorial departments resulted in a user-friendly website that presents information at levels meant to appeal to multiple audiences. For the casual browser, quick but scholarly definitions of relevant artists, processes, journals, and galleries related to the photographs provide basic context. For researchers, and those interested in learning more, links to exhibition catalogues, similar prints, and even prints from the same negatives in other institution's collections offer art historical resources. Detailed material and elemental analysis of 44 prints presented in specially designed PDFs (including results of XRF spectrometry, IR photography, FTIR spectrometry and UV radiation induced visible fluorescence) offers an invaluable resource for conservators and conservation scientists interested in Pictorialist photography. All of this was built using a modified WordPress template, utilizing that platform's intuitive content management system to allow for easy uploading and updating of the data and images. As a poster, this presentation will address the unique intersection of art history, conservation and digital experience that this project demonstrates, and hopefully inspire others to think closely about how to make

### 61. Corn and Tobacco Residue: Development of protocol for sampling and analysis

*Wendy Lindsey, Dr. Nancy Odegaard*

Residues found on an archaeological object may contain crucial clues to the object's use in antiquity. However, thorough residue analysis is often difficult, due to confounding contamination or a lack of access to instrumentation and analytical protocols. Therefore, residue analysis often falls outside the scope of conservation treatments, so the

information contained therein may be lost during cleaning. Residues may also hinder the application of protective coatings, so their detection and analysis is a key step towards a successful treatment. Using documented pottery collections from the Arizona State Museum, we are developing a best practices methodology for chemical instrumental analysis to characterize residues left by corn and tobacco, using minimal sampling or non-destructive techniques. In addition, we are focusing on widely available techniques, including Gas Chromatography - Mass Spectrometry, to increase the probability that our protocols will be easy to apply. By making residue analysis more straightforward, we hope to encourage conservators to incorporate analysis into routine treatments. This analysis will simultaneously allow conservators to make more informed decisions about treating an object while adding to its archaeological record.

### 62. Evaluating (poly)ethylene vinyl acetate (EVA) Adhesives for Use in Wax Conservation

*Marina B. Gibbons*

Relatively heavy three-dimensional wax fragments, which cannot be consolidated due to their low porosity, have a particular need for ethically reversible or re-treatable adhesives that are also stronger than natural polymers. However, the only adhesives that can be safely used on culturally modified wax blends are those which are both delivered and reactivated in water. This study evaluates existing approaches to repairing wax objects through conservation literature and modern case studies, and investigates the properties of three commercial conservation (poly)ethylene vinyl acetate (EVA) adhesives in order to gauge their suitability for use in new treatment methods. The water-reversible EVAs in this study are Evasol by Book Restorations, EVA Neutral pH by University Products, and the formulation of Evacon-R™ by Conservation By Design that was discontinued in 2014. Their suitability for use in collections is investigated through the 'Oddy' accelerated ageing test as well as a newer experimental method of measuring atmospheric yellowing through nitrogen oxide exposure, pH testing, and compositional analysis with Fourier-transform infrared spectroscopy (FTIR). The adhesives' ageing properties appear to be linked to their trace biocidal components. The instability of bronopol is identified as a particular problem for Evacon-R™ and, to a lesser extent, EVA Neutral pH. Following the results of these tests, Evasol was successfully used in repairing a series of wax portraits at the Royal Albert Memorial Museum (RAMM) in Exeter. Future proposed directions for wax conservation methods include the continued investigation of EVA-starch paste blends.

### 63. Impact of Airborne Mycobiota on the Biodeterioration of Materials and Human Health in Three Cuban Heritage Institutions

*Sofía Borrego Alonso, Oderlaise Valdés Pérez, Alian Molina Veloso*

Biodeterioration of cultural heritage is enhanced in tropical climates by the high temperatures (T) and relative humidity (RH) during most of the year. In some Cuban heritage institutions, the ventilation or air conditioning is ineffective there is overcrowding and high levels of dust are accumulated favoring the presence of high concentrations of airborne microorganisms. By its effective dispersal mechanisms,

wide metabolic versatility and adaptability, anemophilous fungi are the main agents causing alterations and damage to the Cuban documental and museological heritage. The affectations and its intensities on the materials depend on the groups or species that colonize it, the characteristics of the substrate and environmental conditions. Also, numerous studies have established a close relationship between environmental conditions, the presence of anemophilous fungi and their impact on the occurrence of allergic illnesses. Aerobiological studies in heritage institutions let to determine the fungal taxa with higher biodeteriogenic and pathogenic potential in the environment, important issues for preventive conservation strategies and quality of life of staff. Therefore, the aims were: i) to evaluate the concentration and diversity of airborne mycobiota in three Cuban heritage institutions (one museum and two archives), ii) to characterize the biodeteriogenic and pathogenic capabilities of the isolates. The air samples were taken inside and outside repositories of three heritage buildings located in Old Havana municipality (Havana city) using a biocollector. Two repositories were acclimatized while the other was cross-ventilated natural system. The ecological criteria relative density (RD) and relative frequency (RF) were determined. In the isolated strains cellulolytic, amyolytic, proteolytic activity and excretion of pigments and organic acids were determined qualitatively, as well as the ability to grow at 37°C and toxins secretion. The fungal concentrations in repositories did not exceed the 250 CFU/m<sup>3</sup> which were positively correlated with RH ( $p \leq 0.05$ ). However, the museum repository showed the highest concentrations and RH, such issues suggest a close relationship between the two variables. Twenty-two genera and three mycelia nonsporulating were detected; this is evidence of fungal diversity in these ecosystems. Genera *Aspergillus*, *Cladosporium* and *Penicillium* were predominated according to RF, its RD in each repository were related to ventilation and dust accumulation. The 82% of isolates showed high ability to degrade the organic compounds evaluated, excreting acids and pigments, which showed its broad biodeteriogenic potential while 40% were able to grow at 37°C and secrete toxins, for that reason they can be classified as dangerous opportunistic human pathogens. The most dangerous strains for materials and staff health according to in vitro assays corresponded to *Aspergillus* spp.

#### 64. The Evolution of a Method: Optimizing the Use of Evolon® CR to Poultice Varnish on a Large Scale

*Kari Rayner*

It is not uncommon for conservators of cultural heritage to encounter issues with scaling up a technique during treatment: testing a method in a small area seems to be successful, only to find that unexpected challenges may arise when applying this technique to an entire artwork. In such instances, it is valuable to be aware of the alterations or modifications one may make to a method to suit the requirements of a specific treatment. To this end, this poster describes the experimentation undertaken to optimize varnish removal from a painting on a large scale using Evolon® CR, an absorbent fabric composed of synthetic microfilament. This treatment was completed in the spring of 2016 during a post-graduate internship at the Hamilton Kerr Institute of the Fitzwilliam Museum, University of Cambridge, UK. The painting in question, *The Duke of York*, is part of the collection of The Honorable Society of The Middle Temple in London. Attributed to John Riley and recognized as a copy after a painting

executed by Sir Peter Lely in 1674, the work is dated to 1684 and measures approximately five feet in width and nearly eight feet in height. Small tests indicated that varnish removal using solvent on cotton swabs was problematic due to the thickness and polarity of the aged natural resin coatings, necessitating prolonged swabbing with polar solvents. Additionally, the paint appeared abraded and was underbound, likely due to past overcleaning, raising the concern that protracted mechanical action would pick up pigment. As a result, an alternative method of varnish removal was sought. While the use of solvent gels was considered, efforts focused instead on developing a technique to poultice the varnish using Evolon® CR, reducing the need for additional mechanical action to remove gel residues. Although initial tests with small squares of the fabric saturated with solvent were found to be successful, a number of issues were encountered when attempting to scale up. Experimentation sought to optimize a number of factors, including: the dimensions of Evolon® CR used; the means of saturating the fabric with solvent; the method of placement; and the duration of application. A strategy was developed to limit solvent leaching and increase the precision of placement, delivering solvent to a targeted area with large squares or custom-cut shapes of Evolon® CR up to 6 inches square in size. In addition to describing the optimized technique, this poster will discuss the theoretical advantages and disadvantages of the Evolon® CR method as well as provide context. Poulticing varnish in this manner will be compared with the use of solvent gels and with the tissue gel composite cleaning method published by Fife et al. at the Stichting Restauratie Atelier Limburg (SRAL) in 2011. It is hoped that publishing this case study will aid paintings conservators facing similar issues during treatment and inspire additional discussion regarding this method.

#### 65. Elucidating Daguerreotype Degradation Through Surface Species Formation Using Localized Surface Plasmon Resonance Spectroscopy

*Silvia A. Centeno, Andrea E. Schlather*

The nanostructured silver-mercury or silver-mercury-gold daguerreotype image is particularly reactive and prone to degradation by tarnishing, oxidation, and photodamage.<sup>(1-3)</sup> Treatment protocols to reverse existing signs of degradation have all but halted, as many historical efforts to clean daguerreotypes have been shown to promote further damage.<sup>(3,4)</sup> Conservation efforts are complicated by a lack of understanding of the composition and reactivity of the nanostructured surface that forms the daguerreotype image. Numerous studies over the past few decades have identified various surface species and have partially elucidated the mechanisms by which they react;<sup>(4,5)</sup> however, many questions remain unanswered. Using angle-dependent scattering spectroscopy, we have developed a protocol to measure nanoscale changes of the daguerreotype surface using the localized surface plasmon resonance (LSPR) of the Ag/Hg image particles, which are extremely sensitive to changes in their composition and dielectric environment. Studying spectral shifts in the LSPR of the image particles upon controlled exposure to environmental elements such as humidity, oxygen, chlorine, and sulfur provides further insight into image deterioration occurring from surface reactions. This method has been combined with other spectroscopic methods, such as Fourier-transform infrared spectroscopy (FTIR) and surface-enhanced Raman spectroscopy (SERS) to offer a more complete view of daguerreotype

degradation at the nanoscale level. Until we have a comprehensive understanding of how daguerreotypes interact with their environment, these images remain in peril of irreversible damage.

#### References

1. Marquis, E. A., Chen, Y., Kohanek, J., Dong, Y. & Centeno, S. A. Exposing the sub-surface of historical daguerreotypes and the effects of sulfur-induced corrosion. *Corros. Sci.* 94, 438–444 (2015).
2. Centeno, S. A., Schulte, F., Kennedy, N. W. & Schrott, A. G. The formation of chlorine-induced alterations in daguerreotype image particles: a high resolution SEM-EDS study. *Appl. Phys. A* 105, 55–63 (2011).
3. Ravines, P., Wiegandt, R. & Wichern, C. M. Surface characterisation of daguerreotypes with the optical metrological technique of confocal microscopy. *Surf. Eng.* 24, 138–146 (2008).
4. Da Silva, E., Robinson, M., Evans, C., Pejović-Milić, A. & Heyd, D. V. Monitoring the photographic process, degradation and restoration of 21st century Daguerreotypes by wavelength-dispersive X-ray fluorescence spectrometry. *J. Anal. At. Spectrom.* 25, 654 (2010).
5. Centeno, S. A., Meller, T., Kennedy, N. & Wypyski, M. The daguerreotype surface as a SERS substrate: characterization of image deterioration in plates from the 19th century studio of Southworth & Hawes. *J. Raman Spectrosc.* 39, 914–921 (2008).

## 66. National Argentinian Flags, the Bicentennial and the Change of Criteria Regarding Conservation

*Maria Sol Barcalde, Patricia Lissa, Ivana Rigacci*

Between the years 2010 and 2016, on the occasion of the Bicentennial of the American Revolutions and the Independence Wars in Argentina, projects regarding the conservation of the historical collections of our patrimony were carried out. Amongst them special attention was given to historical flags and banners. They are distinctive of the identity of the new national revolutionary armies and represent an important historical document from the XIX century. Changes in the intervention and the exhibition of the vexilological textile patrimony of the country started. Historically, the Argentinian museums collected Spanish flags taken as war trophies and the flags created in the country by the local regiments. Their intervention was carried out until the late XX century by conservators of other materialities such as paper or paintings, the result being restorations with methodologies similar to the ones employed with these types of materials. This process meant a consolidation with organic adhesives on materials such as cardboard, paper or other textile support, turning them into flat rigid pieces. Although in many cases this procedure was effective compared to no intervention at all, and numerous flags owe their survival to these sometimes irreversible interventions, we currently prefer less invasive, more reversible methods, with more compatible materials, based in the use of conservation stitches. The same concept was applied to their exhibition; they were exhibited as pictures, tautened vertically, sometimes nailed and framed, or folded inside small wooden and glass cases, thus generating several damages and with no regard for illumination or environmental controls. The present work describes the valuing through the intervention and changes in the display of the most emblematic flags of our history during these last 6 years, all made of silk, including the first flags of the national armies dated 1813, called “Banderas de Macha” (Macha is a place in Bolivia). These sibling textiles are currently located in Argentinian and Bolivian territory and gave birth to an international cooperative project between both nations for the restoration of the flags with the addition of a training course for Bolivian conservators in the city of Sucre, Bolivia. The interventions

included a new approach on the restoration of the Argentinian textile patrimony: the complete documentation process of the textile, their analysis, consolidation with stitches and new exhibition systems based on the use of conservation materials on inclined surfaces in order to reduce the mechanical and physical damage on extremely fragile textiles, aiming to achieve a unified exhibition criteria.

## 67. Initial Treatment Techniques for Japanese Lacquer-based Metallic Thread and Cut Paper Appliqué

*Elinor Dei Tos Pironti*

This poster addresses an *urushi* (Japanese lacquer) based metallic thread that was used on an embroidered Japanese, early to mid-Edo period Nō Theater *Chōken*. There were five motifs, each a variation of a naturalistically depicted spray of flowers set in a vase. The couched metallic thread was used to outline each of the five vase shapes, two insect bodies and their antennas which alone appear on the center back motif, and the four butterflies which are on the lower edge of the front and back body panel.

\*The couched metallic thread was originally made by using *urushias* an adhesive which bound a metal foil to a paper substrate; the paper was then cut into narrow strips and wound around a silk core. \*These metallic threads suffered from severe surface flaking. No prior documented stabilization methods for this type of *urushi* based metallic thread was found in conservation literature or in additional readings. \*Testing was done to establish that the adhesive was most certainly *urushi*, and the concept of using like materials to stabilize like materials was the basis for my choice of *urushi*. Synthetic adhesives posed a greater potential for unforeseen long term, incompatibility problems and hence were not used. \*The stabilization method was developed by contacting someone in New York City who gives workshops using *urushi* to repair broken ceramics, including at the Metropolitan Museum of Art. This was Gen Saratani. Even though he was not familiar with textiles in general, he showed me some simple steps as to how to use *urushi* and how to control the specifically needed levels of humidity. Skin protection is necessary as *urushi* is related to poison ivy. I was also able to procure from Gen a small amount of two types of *urushi* to test for my project. \*The rudimentary stabilization method used in the treatment of these metallic threads is the topic of this poster.

## 68. Hey Jute: A new approach to visual compensation for hooked rugs

*Kirsten Schoonmaker*

This paper describes a new approach to visual compensation for hooked rugs, developed during the treatment of Molly Nye Tobey's 1942 Victory Garden rug. Now in the collection of the Shelburne Museum, this 40" x 147" hooked rug was exhibited at the 1942 Women's International Exposition of Arts and Industries, where it was awarded first prize and the Grand Award for its design. The enthusiastic response to the rug's design prompted Tobey to begin her Statehood series of fifty hooked rugs, also in the collection of the Shelburne Museum. Like many hooked rugs in the collection of the Shelburne Museum, the jute ground of this seminal large scale rug is brittle with losses of both pile and ground throughout. Previous repairs of these losses, including flat

patches and hooked inserts, were failing and posed two major conservation challenges: First, they were visually distracting, often making use of textures and colors foreign to the initial composition. More importantly, these repairs were structurally damaging, exacerbating existing weakness in the jute ground and accelerating the loss of pile. Building on previously published techniques using polyester felt fills, a method for visual compensation was developed that utilized cut and sculpted densely needled felt, colored with textile paints, to mimic the worn shapes and varying tonalities of the pile elements adjacent to the losses. This poster will include a discussion of Tobey's chosen materials, review alternative methods of visual compensation for hooked rugs, and conclude with an evaluation of the efficacy of this treatment.

## 69. Conservation and Restoration Strategies of Rare and Large Historical Carpet

*Prof Dr. Harby E. Ahmed*

The paper presents strategies for the conservation restoration of historical carpet in Egypt that have been in uncontrolled storage and display. The historical carpet (370 x 580 cm) is highly decorated with flowers and leaves and geometric decorations; it is multicolored with red, blue, green and yellow and dates to the Ottoman period. The carpet has various types of deterioration such as loss in parts, many separate parts from the edges, stains, and dirt. An examination and analysis of the historical carpet was undertaken in order to develop a plan of conservation treatment. FTIR was used to identify the kinds of dyes and organic stains, and XR-D was used to identify mordants and dust. Light microscope and SEM were used to identify the kind of fibers, their condition and surface morphology. The effects of cleaning materials on the natural dyes were tested. Dry cleaning was used to remove resistance stain and dirt. Temporary cleaning bath was established by the researcher. Add to this, the processes of fixing pieces on new linen fabrics as a preparation for displaying or storage in museum. The method of exhibition will be discussed. Photographs are included to document the conservation process.

## 70. Preserving the Art Works

*Aida Marcela Avalos de Cerna*

The theme to treat in this annual meeting is very important for the museums, because preserving the art works the best way possible is always the goal to achieve; the best decision for an art work is never do a restoration of a piece unless the situation warrants it and is unavoidable to achieve its conservation over time. It is important to know new ways of preserving a work of art, since there is an exchange of institutions, our knowledge could grow about the ways in which other institutions work, and thus applied to our Museum if it works best way to the method of preservation is used, either it can be included within the conservation system. The importance of keeping a collection, is given by the need of leave a historical and cultural legacy to the new generations of each country and of course to the world; there is the need of go innovating to be more diligent in the care of the art works and not leave it as a need secondary to consider within the institution that custody a collection. In the case of El Salvador, our society needs to learn about the value that has the culture areas, because lately is the area that is leaves more unprotected and vulnerable, since not is seen as a primary need; works of art need and should be retained as the most

optimal so that it lasts by more time in appropriate conditions. The museums have the obligation of care for the works of art that are low its custody, likewise is important instruct to our young in the value that implies a work of art, as is its value historical and artistic. The country can tell its history through the works and this is the area that needs most awareness in people. If we can educate people from an early age in the importance of culture in each country, we can get institutions more importance and support; many times, museums are forgotten or left last in the list of priorities of a Government plan. Currently at the Museo de Arte de El Salvador (MARTE), we use several methods to help for the art works conservation that are found in the exhibit areas as in the deposit: one is the temperature measurement, the average handles 25°C (+ or - 3°C); another measurement that is performed is the relative humidity of the environment, which has an average of 52% (+ or - 3%); we have lighting control in the exhibit areas. As well we do a periodic surface cleaning of works of art.

## 71. What Happened to Them? Preliminary approaches from conservation discipline in cases of human rights violations during the military dictatorship in Chile

*Daniela Bracchitta, Iván Cáceres, Kenneth Jensen, María José Manneschi, Roxana Seguel*

September 11, 1973. The President Salvador Allende is overthrown in a coup d'état and the military dictatorship is installed in Chile. For 17 years, the country faced repression practices and violations of human rights that still have not been completely quantified. The official numbers of the Valech report (2011) figured 40,280 cases of voluntary testimony which were proved as a political prison, death and torture crimes. In addition, some 200,000 people suffered exile and an unknown number went through clandestine centers and illegal detention. Of the recognized numbers, 3,065 had been dead and missing. Many of them were kidnapped or escorted by soldiers and were not seen again. Is that so, as the question stuck in the collective memory for more than 40 years has been... and where are they? Leaders and perpetrators of these unconfessed crimes are dying in silence, and many families are still asking the same question. That is why in scheduled excavations or finding within the framework of possible missing detainees, the great goal pursued is to identify the victims. However, accomplishing this goal creates a new question... what happened to them?

This presentation aims to provide a preliminary account for a conservation expertise for clothing of two political executed. This is an ongoing case and it is carried out by a multidisciplinary team of archaeologists and physical anthropologists, as well as professionals from the Legal Medical Service of Santiago. The conservation area was requested with the purpose to detect any alterations in textiles that provide useful information to clarify the circumstances of the investigated deaths. We used the methodology designed by the laboratory for archaeological textiles studies and the theoretical framework was a systemic understanding of the formation processes of an archaeological site. Extrinsic/intrinsic factors/agents of deterioration/preservation were reviewed to be linked to the alteration effects on clothing. At the same time, the forensic reports, autopsy, and testimonial descriptions were used to contrast the consistency of the observed. On the other hand, analysis to samples of fibers and other "not identified" elements

were carried out by optical microscopy and FTIR, in order to complement the hypothesis about the alteration processes.

To date, results indicate some discrepancy between the evidence (or lack of evidence) observed in clothing considering facts and burial context, but unfortunately it will be difficult to establish specific hypothesis regarding this last subject. Reflecting what was referred in the first paragraph, these excavations pointed to identify the victims, therefore times for digging are short and focused to that goal, and the background of formation and transformation process of the site, most of the time are dismissed, especially if the sites had been considered as a disturbed area. However, this presentation also intends to suggest what variables are required to consider in-situ despite the disturbance of the site in order to achieve an accurate conservation diagnosis—further on a reasonable doubt—and helps to discover what happened to them, especially because evidence can disagree with the expected.

## 72. Best Practices, Creative Problem Solving and Balancing Compromises in Conservation Treatments

*Elizabeth Curran Boody*

This poster will outline the challenges of conservation treatment for material used in an active Special Collections Library highlighting specific examples of successful outcomes to challenging projects. One of the major focuses of the Special Collections Library at Dartmouth College Library is to encourage active use of its collections, especially by faculty bringing classes into the library. Last year over 400 classes came to the library to study primary sources. In addition to class use, the library is open to the entire community and outside researchers. With this high use and open door policy the collections are accessed more than a typical restrictive graduate library might. Therefore, in order to find a sensible treatment, we must strike a balance with the ethics of conservation, the best treatment for the object itself, and the reality that it may be used by a patron who might not be aware of how to handle rare or fragile materials. This can render our job as conservators to be quite challenging at times. In creating a treatment proposal for these objects, and thinking about overall collection care, Conservation staff engage in a dialogue with the Special Collections staff to arrive at a consensus of the best treatment plan and answer the important question that steers the boat of Conservation: “How is this object being used?” An example of an object that we have found a satisfactory solution for is our first edition of *The Book of Mormon*. Founder Joseph Smith was born locally and many Latter Day Saints come to visit the area, and are drawn to view and behold a first edition copy of this important book. Because this object is frequently requested and handled by all kinds of patrons (it actually never returns to the stacks due to how regularly it is viewed), it has been placed in a box with a built-in cradle to provide a restricted opening and to signal to the patron the care and attention this item deserves. Other objects in the collection with more or less successful treatments have been a collection of large Edward Curtis photograph books with crumpled interleaving due to frequent usage. We decided to put new interleaving for the purpose of protecting the photos and remaining aesthetically true to the original format. A less successful example would be a foldout color plate from the anatomy book *Suite de l'Essai d'anatomie en tableaux imprimés* illustrated by Gautier d'Agoty that was fitted with linen and paper tabs make the page removable, but has proven to be a challenge for students to manage.

## 73. Conservation of Showed Pieces at Museums of Historian Office of Havana

*Joyce Hidalgo-Gato Barreiro*

The Conservation scientific literature deals mostly with objects in storage. Those on permanent exhibition, in contact with visitors and exposed to environmental damage, do not receive the same attention by researchers who study and take care of collections in museums. Most museums under the Office of the Historian of Havana are housed in buildings of heritage value, built between the 16th and the 19th centuries. Those buildings have very large doors and windows, lucernas (a kind of window over the doors), wide walls with mural paintings, plaster ornaments and wood ceilings, among other characteristics. As a result of the insular condition of Cuba and the materials present in the fabric of these buildings, there is the inevitably presence of high levels of Relative Humidity and Temperature, and some other factors like high levels of natural light and the presence of biological agents. The technology available when the Museums exhibitions were opened in the 70's, depended on display cabinets made of wood and common glass, which additionally integrated the exhibition with the building characteristics, according to the museographic criteria of the period. The factors mentioned above, affect not only the display cabinets themselves, but also the objects on display. This study proposes a new kind of display cabinets made with environmental agents resistant materials that provide protection to objects, not only from anthropomorphic damages, but also from those caused by biological agents. The availability of new materials, access to new technologies and international museographic trends make this possible. The design versatility of the new display cabinets, include the requirements of any museological guide and offer a wide range of museographic solutions. The author designed a new type of display cabinet as a part of a new museographic project for the Archeological Museum, now in a restoration process, located in the Historical Center of Old Havana.

## 74. The Development and Testing of Gel Cleaning Systems for Cleaning Inorganic Supports in Argentina, Curazao, and the Dominican Republic

*Giselle Canosa, Ruahidy Lombart, Viviana Dominguez*

The re-formulation of cleaning gels for the removal of dirt and salts from tile project is based on the comparable results of three professionals based on three different countries. The cooperative project is carried out not only based on the grounds of measuring results of an improved traditional cleaning systems but also on the need of synergy among the professional of nations in Southamerica and The Caribbean. The authors are committed to add prospectives, bridge distances and as a result open new opportunities in our field.

The agreement for this project arises from numerous discussions undertaken within the framework of the celebration of the First Congress of preservation—ApoyOnline—held in the city of Medellin, Colombia. The starting point of the project is the research being undertaken by Conservator Giselle Canosa in Argentina on re-formulating gel cleaning to improve performance. The system will be tested within the next five months by Mural Conservators Ruahidy Lombart in Santo Domingo in the Dominican Republic and Viviana Dominguez in Willemstad in the island of Curacao. Paul Giudicelli's tile murals, from 1959/61, are located in the Dominican Republic

an island with torrid rains and high humidity while Charles Eyck tile mural from 1960 is located on the dry island of Curacao. In Buenos Aires, Argentina, the gels will be tested on two tile murals by Alfredo Guido that were produced by Cataneo and Company in 1938 and are located on the city's subway. In addition, the team intends to explore network communication as a means for collaborative exchange, transfers of experiences allow them to obtain initial data on color characteristics, surface absorption, composition, among others. This will enable the unification of methods of intervention and thus elucidate their relative effectiveness, making comparisons of the results arising from the intervention methodology. Through this project the professionals look to develop a methodology into concrete practices in applying a cleaning system with non-traditional gels used on inorganic supports located in three dissimilar environmental conditions. The conservators also seek to ascertain the reactions that they can experience and compare similarities and differences in the results. This pilot project intends to not only address the development of our cultural heritage but also to improve relationships with our colleagues that can use this working format.

## 75. Expanded Descriptive Terminology for Contemporary Collages

*Stephanie Lussier, Michal Mikesell*

This poster discusses guidelines for consistent descriptions of contemporary collages. Unlike historical collages, where cut or torn paper is adhered in layers to create a two-dimensional work, contemporary collages created since the 1960's incorporate a greater variety of materials and construction methods. Building on the vocabulary and syntax established by "Descriptive Terminology for Works of Art on Paper: Guidelines for the Accurate and Consistent Description of the Materials and Techniques of Drawings, Prints, and Collages" (Ash, Homolka, Lussier, 2014) this poster expands on the existing guidelines, which provide general descriptive language for collage materials and a hierarchical structure that guides word order, by providing a system for describing the construction of these complex works of art. This expanded system was informed by the assessment, selected analysis and treatment of nearly two hundred collage works, dated from 1913 to 2000, in the collection of the Hirshhorn Museum and Sculpture Garden. The terminology allows for the inclusion of support materials, media, and construction methods based on observations of contemporary collage examples. Consideration is given to attachment methods such as local vs. overall attachment, mechanical systems such as staples, overall coatings, and the use of adhesive layers as distinct design elements. Materials, such as tapes and staples, are also considered with respect to their aesthetic (design elements), as well as functional (attachment method), roles. Several examples including unique cases such as when paint media is used as an adhesive are presented. The goal of this expansion of the descriptive terminology is to provide increased understanding of collage fabrication when communicating the materials and methods of contemporary collage works.

## 76. Replacement of Toxic Solvents: A practical approach for art conservation studios

*Luciana Murcia*

Historically, several solvents have been and continue to be used in conservation studios for different kinds of procedures, such as varnish cleaning, in painting removal, dilution for commercial pigments used in retouching, among others. The most common solvents used in these procedures are based on aliphatic and aromatic hydrocarbons, the latter having the most harmful health effects due to their high toxicity. A solvent's ability to remove a given compound by dissolving it depends mostly on its polarity. In order to achieve the appropriate polarity, both solvent solutions types (aliphatic and aromatic) and their derivatives are used depending on the substance to be dissolved. There are currently certain products and solvent mixes (Shellsol, Arosol, White Spirit) sold around the world that replace, in some cases, the more toxic kind of solvents. In Latin America, however, they are either unavailable or sold at very high prices. Therefore, many conservators still use solutions that are high in toxic solvents (toluene, xylene, turpentine), as they are the widest-known and most easily available in the market. The aim of this research is to replace the more toxic common solvents with organic solvents dissolutions that are far less toxic yet equally effective and easily accessible in the local market. Solutions were developed based on paraffin and cyclic saturated open-chain hydrocarbons that are less toxic than aromatic and high-toxicity, non-aromatic ones commonly used. Paraffin hydrocarbons were chosen for study based on their polarity as well as their maximum acceptable concentrations (MAC) as per international standards. The dilution of commercial pigments for retouching and varnish removal were used as reference, being common practices in conservation studios and both requiring the use of solvents. Tests were conducted using different varnishes and commercial pigments for retouching to assess the effectiveness of the solutions and draw conclusions, placing particular emphasis on analyzing both natural and synthetic resins. Tests reveal that, even though no mix proved to be effective in all cases, simple paraffin hydrocarbon mixes and minimum aromatic hydrocarbon concentrations can lead to effective solutions in both procedures under analysis, with a significant reduction of toxicity posing no risks to the works of art being restored. We also demonstrated that the commercial solvents analyzed are not reliable when it comes to reducing toxicity, as manufacturers fail to reveal their specific composition in the Product Safety Data Sheets and actual percentage of toxic solvents used in their mixes. Using lower toxicity solvents is not only beneficial to the conservator but also to the environment, which is why it is important to find affordable and easily available substitutes to eliminate such toxic substances from conservation studios.

## 77. Microorganisms Inhabiting our Collections

*A. Echávez, J.D. Dorado, Maria Camila Patiño, John Simmons*

The Military University Nueva Granada is working on the consolidation of a "Campus Ecomuseum" that seeks to integrate natural heritage and diverse collections in their care. Among these collections, we can find the National Museum of Telecommunications with objects such as telephones, television sets, radios, telegraph equipment, books, record players, and an audiovisual collection with vinyl records,

photographs, slides, 8mm films, VHS, Betamax, among others. In the field of art, there are two- and three-dimensional works distributed in the Campus made with different techniques and available to the public. The University's Science laboratories keep the Natural History collections including the herbarium, mollusks, insects and vertebrate collections. This study aims to explore the microbial diversity living in our collections, through the isolation and identification of microorganisms that may be potential agents of deterioration, changing the structure and stability of the materials by enzymatic reactions and metabolites production that cause chemical and structural damage. The results of this study showed the relationship between the microorganisms isolated from the materials and from the storage or display environment. The final product is a visual guide that shows biodiversity inhabiting our collections at the microbial level, as tool for diagnosis and conservation.

### **78. Preservation and Conservation of Pablo Neruda Collection: Intrinsic and environmental considerations**

*Yerko Andrés Quiral*

The "Neruda Collection" belonging to the Central Archive Andres Bello of the University of Chile, is a personal collection of the Literature Nobel Prize Ricardo Neftali Reyes, known as Pablo Neruda (1904-1973). The donation to the University of Chile was made while he was alive and was declared a historical monument by the National Monuments Council of Chile in 2009. According to its materiality, the collection has been divided into: Bibliographic Section (4,961 volumes of books), Malacological Section (7,784 conch shells specimens), Hemerographic Section (263 magazine titles), and a Sound Section (155 recordings). The topics covered in the literature section are from the countries where he served as ambassador (China, Mexico and France, etc.), works of Latin American poets from the colonial and republican period, natural history books and dedicated books. The mollusks were collected from Chile, Latin America, Asia and Oceania. The magazines reflect Neruda's political interests and social activity. Finally, the sound section represents his personal musical preferences. The Neruda Collection has always been a priority. We began working with the bibliographic section of the collection and a conservation survey was carried out on the material: number of copies, oxidation state, tears, microbiological contamination and insects, among others. In a second stage, restoration treatments were completed, with particular emphasis on books contaminated with fungi and books with specific deterioration processes. In the preservation process a number of fungal infections were detected in the room housing the collection in the Central Archive Andres Bello, as well as in the conservation / restoration laboratory of the Archive. One of the most effective methods for the conservation of large holdings, as this collection, is the environmental control on the different deposits. It is the most effective from the point of view of economics and the conservation of the documents. Microorganisms do not proliferate when the air is moving and low relative humidity and temperature are constant. Both temperature ( $T > 20\text{ }^{\circ}\text{C}$ ) and relative humidity ( $\% \text{RH} > 60\%$ ) foster all deterioration reactions, causing fungal growth and pest proliferation. Based on these criteria we evaluated the fungal diversity present in the Bibliographic Section and the degree of biological degradation of all the books. In addition, environmental temperature ( $T\text{ }^{\circ}\text{C}$ ) and Relative Humidity ( $\%$ ) were recorded and the environmental bioburden in the

room housing the Bibliographic and Malacological collections was measured. Environmental monitoring has been proposed as the best strategy for preservation and conservation of collections and museums. The comprehensive study of the collection and environment provides the best solution in Conservation Plans and restoration of historical and material of heritage value.

### **79. Project for Training Preservation and Historic Services Staff for Historic and Heritage Buildings**

*Giselle Canosa, Alba Pereiro, Maria Pia Tamborini*

One of the most frequent problems in the damage of historic objects is caused by poor handling by the maintenance staff once the restoration is finished and the value of the heritage is enhanced. The lack of a common language between the two parties, conservators and maintenance people, contributes to the problem. The Training Preservation Assistants Program provides the necessary tools to teach General Services Staff at Heritage Buildings so that they can work as assistants in this field. The project seeks to offer simple but practical information and basic training. The attendees will be introduced to the basic notions for the preservation of Heritage Buildings' materials as well as to the actual preservation criteria and daily maintenance of the organizations that keep and safeguard the works of art. Thus, they will be able to recognize the general aspects of the different supports and the causes of their deterioration. They will be educated on the importance of the implementation of maintenance protocols for and their application for preservation. Finally, the students will be trained in rescue procedures in emergency preparedness and recover planning in case of a disaster. The project consists of two curricular designs independent from each other. The first is oriented towards a formal and vast training in which the assistant will be presented with the principals of conservation and advanced knowledge of constitution materials, adequate handling of objects when performing daily maintenance tasks, basic notions of chemistry for understanding the products to apply in the daily preservation and the making of a cleaning and daily maintenance protocol. Finally, the students will be trained in rescue procedures in emergency preparedness and recover planning in case of a disaster. The curriculum comprises 160 teaching hours to learn about the various materials composing the historic building and its objects, including furniture, molding among others. The second curriculum is designed for training the staff in the basic notions of preservation for its immediate implementation. This curricular design stresses or highlights the importance of receiving a higher and more extensive instruction and will only be given as training without formal certification. Sponsored by the Argentine Association of Conservators and Restorers (ASACOR), participants in this program will receive formal certification issued by the Argentine Ministry of Labor. Through the certification from the Ministry of Labour, our intention is to make this training mandatory to perform such activities in heritage buildings, as well as providing this training both nationally and internationally. During the 1 Regional Conference organized by ApoyOnline, held in Medellin, our colleagues expressed their interest in our program as they confront the same type of problems on their institution. For this reason, our program is ready to provide international training.

## 80. Bedbugs: A pesky problem

*Meredith Wilcox-Levine*

Insect infestations in and around ethnographic and historic objects have long been an issue for conservators. In museum and private collections pests have severely damaged historic and artistic textiles. The main culprits, webbing moths and carpet beetles, consume protein fibers, damaging wool and silk pieces in varying degrees. Unfortunately, as a result of pesticide resistance and other factors, bedbugs have been added to the list of pests infecting objects treated by conservators in the last few years. Once considered only a problem in run-down, unhygienic housing, bedbug (*Cimex lectularius*) infestations have “undergone a resurgence in pest status and can now be found even in the finest hotels and living accommodations.”\*

These resilient pests feed on humans almost exclusively, biting and consuming blood from sleeping or sedentary targets, mostly at night. During the day, bedbugs retreat to hide in dark and hard to access places near where they tend to feed. Successful eradication is particularly difficult, as is testified to by professional, commercial pest control specialists. The conservator has the additional concern that bedbugs can damage textiles, by leaving behind fecal spots, blood spots, egg cases and odors. This case study focuses on the treatment of a Lakota tipi liner, brought to the Textile Conservation Workshop in 2016 because of a bedbug infestation in a client’s home. A literature review was conducted regarding current pest management protocols and procedures used by conservators and by professionals in the commercial pest control industry. The most widely accepted treatments used by conservators include vacuuming, low-temperature treatment/freezing, and anoxic chambers. Some references to heat treatment solutions for infestations have been recently published. Where bedbugs are concerned, heat treatments can be very effective. Commercial treatments of bedbug infestations include several different extreme heat temperature methods, only some of which could be considered for use on historic textiles. The research object examination, and eventual freezing and then heating procedures that were implemented in this case, are the result of searching for a low-tech solution to adequately eradicate bedbugs in textiles and composite objects.

\*A. M. Sutherland, UC Cooperative Extension, Alameda Co.; D.-H. Choe, Entomology, UC Riverside; and V. R. Lewis, Environmental Science, Policy, and Management, UC Berkeley.

## 81. Preservation Week: Ludwig von Mises Library, University Francisco Marroquín, Guatemala

*Marisol Zuñiga*

The library Ludwig von Mises began as a small preservation laboratory in 2006; over the years, the UFM acquired different equipment, tools and materials needed to work with different procedures of preservation and conservation, making it unique in the country. In 2007, the staff of the preservation laboratory started to teach workshops and open lectures to the public. Recognizing the need for knowledge for training in themes of conservation and restoration of books and documents in the country, we looked to the American Library Association (ALA) and in Guatemala, we implemented a “Preservation Week,” like in the USA. We offered and promoted the activities in the same dates as is in United States, though these activities were adapted to be unique to Central America. Preservation Week is a full week of activities. International experts are invited to teach lectures and workshops on

conservation, preservation and restoration of books and documents. This year, we celebrated 7 years offering different activities, with a total of 10 specialists from around the world, including United States, Argentina, Chile, Ecuador, Mexico, and Uruguay, with 17 conferences given and 20 workshops of different specialties. The conferences and some workshops can be found in the video recording at [newmedia.ufm.edu](http://newmedia.ufm.edu), with free access. The event includes lectures open to the public and workshops of different themes. The principal objective is to focus on Guatemalans and Central Americans, promoting knowledge on conservation, preservation and restoration of paper materials, to conservators, rest orators, collectors, booksellers, archivists, museologists, librarians, and public in general, to encourage and teach them about paper care and good handling of books and documents, and for people to increase their professional networking.

## 82. Environmental Preservation Practices to Avoid

*William P. Lull*

To directly mitigate the impact on global climate change, many standards and codes are requiring buildings to reduce their energy use. This includes US Green Buildings Leadership in Energy Efficient Design (LEED), ASHRAE Standard 189.1, and NYC Local Law 87. Unlike LEED and ASHRAE, NYC notes that certain institutions should be an exception to these rules. Taking the cue from NYC, museums, libraries and archives should be none too ready to adhere to LEED and ASHRAE. Many “energy efficient” techniques suggested or mandated by LEED and ASHRAE are counter-productive to the fundamental goals of collections preservation and should be avoided. These include Daylighting, Air-Side Economizer, Reset Space Temperature, Occupancy or Night Shut-Down of Equipment, Seasonal Boiler Shut-Down, Chilled Water or Supply Air Temperature Reset, Green Roofs, “IAQ” and Productivity Arguments, Rooftop Photovoltaic Array, and Ground-Source Heat Pumps (“Geothermal” (sic)). This presentation defines these techniques, and why they are inappropriate for library and archives preservation environments.

## 83. The Bay Area Conservation Science Initiative

*Elise Effmann Clifford, Elizabeth S. Peña, Susan Roberts-Manganelli*

The museums of the San Francisco Bay Area host strong conservation departments in a wide array of specialties; the area’s universities are home to preeminent scientists and to some of the world’s top research facilities. Despite these advantages, there are no conservation scientists on Bay Area museum staffs. The goal of the Bay Area Conservation Science Initiative (BACSI) is to consider how to create a conservation science consortium, leveraging the Bay Area’s strengths to serve the needs of both the museum and academic communities. Thanks to a grant from the Getty Foundation, in 2015, the Fine Arts Museums of San Francisco and Stanford University’s Art + Science Lab at the Cantor Arts Center began a partnership to explore the development of a regional consortium. The project included regular meetings with various groups of stakeholders, investigative trips to comparable programs in the U.S., and other research. The poster will present the BACSI process, clearly outlining its major challenges and meaningful opportunities. It will include the principal activities and outcomes of the three major meetings, from the initial introductory meeting at the

DeYoung Museum to the most recent meeting, which included tours of Stanford's science and engineering facilities with key participants. The poster will outline the trips undertaken to see the facilities and meet with conservation scientists and colleagues at the following institutions: • Institute for the Preservation of Cultural Heritage, Yale University • Metropolitan Museum of Art • The Museum of Fine Arts Houston • The Menil Collection • Rice University • The Kimbell Museum • The Amon Carter Museum • The Dallas Museum of Art • The University of Texas, Dallas • Northwestern University (NU-ACCESS) • The Art Institute of Chicago • Getty Conservation Institute • California Institute of Technology Based on this work, the BACSI team has developed several possible models for a conservation science consortium that would be appropriate for the Bay Area context. These models, which will be subject to much future discussion and will form the basis for a white paper, will be summarized in the poster. Through this poster presentation, the BACSI team hopes to communicate with AIC's membership about the project. The goal is to generate discussion that will both help refine the project as it moves toward implementation, while developing good working relationships well beyond the San Francisco Bay Area.

#### **84. Lifting the Microfiber Veil: Utilizing Evolon fabric at the Mauritshuis to remove aged varnish from Hendrick Heerschop's *A Visit to the Doctor***

*Julie Ribits*

This poster will focus on the use of Evolon® fabric as a material for a "tissue method" of varnish removal. Evolon, a polyamide/polyester blended microfiber cloth, is currently marketed industrially as a fabric with a very absorbent internal microfilament structure, ideal for "high-tech" wiping, healthy anti-mite bedding, and technical packaging, among other uses. However, conservation studios in France, Germany, and the Netherlands have begun to test the fabric as a material to aid in "tissue method" varnish removal treatments, with promising results. This poster will highlight a case study from a treatment at the Mauritshuis in The Hague, Netherlands, including testing and subsequent methodology for using the Evolon fabric during varnish removal, as well as potential drawbacks to the technique. Hendrick Heerschop's *A Visit to the Doctor*, a small 17th century Dutch panel painting in the Mauritshuis collection, was brought to the conservation studio for a technical study and treatment in the fall of 2015. Underneath multiple layers of markedly discolored varnish and overpaint, the painting exhibited extensive lead soap formation across the entire painted surface. Though no active paint flaking from these protrusions was observed during preliminary examination, the soaps appeared to have been disturbed and partially removed during a previous restoration, thus requiring a particularly cautious varnish removal method for the current treatment. When a variety of solvent tests with cotton swabs swelled the varnish but required too much time or mechanical action for safe removal, Evolon fabric was suggested as a potential alternative to cotton swabs and other solvent carriers. The microfiber composition of the fabric carried the solvents necessary to swell aged varnish films without leaking and subsequently absorbed the varnish without added mechanical action. Based on the successful treatment of Hendrick Heerschop's *A Visit to the Doctor*, Evolon fabric may be a highly effective material option to consider as a "tissue method" for varnish removal treatments.

#### **85. Future Prospects of Conservation Treatments with a Micro-Aspirator Tool**

*Markus Gross, Friederike Steckling*

The conservators of the Fondation Beyeler have recently been experimenting with a rather unknown tool, the micro-aspirator, which enables new approaches in conservation treatment methods and has shown very promising results. The micro-aspirator can help conservators achieve the ambition of treating surfaces with minimal mechanical action while also preventing the penetration of conservation materials into surfaces, thus significantly reducing the potential for surface abrasion and residues.

Invented and designed by Swiss conservator Benno Wili, the micro-aspirator basically produces a highly controllable suction action by means of a regulated medical pump. Tip-like and different-sized nozzles or brushes are attached with tubing to a vessel which can collect all types of liquids, gels and particles after passing them through a filter. The apparatus is portable and no larger than a regular vacuum cleaner. Treatments of three paintings will be presented in this talk, which were successful in particular thanks to this technology. The micro-aspirator allowed the Beyeler conservators to remove a non-original natural varnish almost entirely swabless from an early Pablo Picasso oil painting of the *Demoiselle d'Avignon* period. The complex surface was treated several times in the past and showed various retouches as well as areas of historical patina which were to be preserved.

Cleaning with the micro-aspirator made it possible to remove only the non-original varnish, leaving the patina and retouches underneath intact by reducing the mechanical manipulation on the surface. In the same manner, a synthetic varnish was removed from the impasto rich paint surface of a large Claude Monet *Nymphaes* oil painting (1916-1919). The micro-aspirator enabled the conservators to reach even into the tiniest crevices and interstices by means of the strong but defined suction. In comparison to other Monet paintings cleaned with swabs, a clear advancement in thorough and even varnish removal was achieved.

The conservators also successfully treated an Andy Warhol silkscreen painting (1984) with the micro-aspirator. Covered by the artist in diamond dust powder directly into the wet paint for a sparkling effect, the work suffered from extreme, almost disfiguring soiling from "real" dust. The only plausible option was to pull off the dust fibres manually. However, with the help of the micro-aspirator, individual dust fibres were easily removed with the right amount of suction strength and control, without affecting or losing any of the original diamond dust particles in which the dust fibres were lodged and tangled. While these are only few examples of treatments with the micro-aspirator, the authors believe there is a potential for further applications which need be tested and considered. Other case studies which have shown promising results will be touched upon, such as consolidation, cleaning fire-damaged surfaces or removing foxing from paper. The micro-aspirator is a promising new conservation tool, but every innovation should also be treated with caution and continuing re-evaluation. The aim of this poster will be to present the applications employed so far, consider future prospects and address possible limitations as an overall introduction to this new technology for the participants of the 45th AIC Annual Meeting.

## 86. Teamwork in its Best: The Stack Numbering Project at the Library of Congress

*Beatriz Haspo, Dallas Grubbs, Megal Moltrup, Madeline Morehouse, Escarlet Silva*

The Library of Congress is the world's largest public library, containing 838 miles of shelving in three buildings on Capitol Hill in Washington, DC, and in off-site storage facilities. The nearly 23 million books, pamphlets, bound periodicals, and other printed and digital materials which are contained and maintained in these collections require space, organization, and specific locations for reference and effective monitoring purposes. Storage areas located on Capitol Hill are generally described by the building name, the floor number, and the side of the building (north or south) as reference points for staff working to locate collections items. The Collection Access, Loan and Management Division (CALM) of the Library is responsible for maintaining and serving the General Collections while ensuring, through appropriate security and preservation measures, that the collection will be available for future generations. Towards fulfilling this mission, in 2005 CALM initiated a process to improve the overall location of the materials in the stacks, numbering the main rows of the general collections storage areas within the John Adams and Thomas Jefferson Buildings. During the next ten years, this numbering system proved time-efficient for staff during space management, retrieval, or refile projects, increasing the staff's productivity. More importantly, the new system proved vital for security by optimizing emergency preparedness and response time. During 2013 and 2016, the Collections Officer proposed and implemented a more detailed locating system based upon previous successful space management concepts introduced at the Library off-site storage facilities. This project added location numbers to each side of a main row and the sections of each row. The project was divided into two parts due to budget constraints and will be completed by mid-October 2016. Multiple teams worked to label the library stacks, execute quality control measures, and perform statistical analyses while also updating the majority of the floor plans. This endeavor to label roughly 93,000 sections across sixty-five decks required the application of 6,000 to 9,000 labels per week (approximately 1,090,000 labels in total). It also demanded physical labor, communication and collaboration among many custodial divisions storing their vast collections in these areas, flexibility, and superior time management. This paper will present how the Stacks Numbering Project at the Library of Congress will improve upon the institution's system of locating collection materials, thus benefiting a variety of stakeholders such as collections managers, library technicians, security personnel, and preservation experts. It will also address how these improvements in the stack numbering system will not only make the collections more accessible for researchers and the public but also minimize the response time of conservators, allowing items to be quickly located and preservation work to be carried out as soon as possible. Through major initiatives such as the Stacks Numbering Project, the Library of Congress is striving to remain at the forefront of collections management standards, designing and implementing plans and protocols to ensure the accessibility, longevity, and security of its nearly 162 million items.

## 87. Sampling of Microorganisms from Egyptian Mummies at the National Museum of Rio de Janeiro, Brazil: A successful adaptation of a vacuum cleaner model

*Ricardo Reis*

The sampling of archaeological materials is expected to preserve their structure from physical damage like breaking or crumbling. Sampling devices have to be adequate to the characteristics of surface and the kind of material to be collected. Pulverized samples are the source of biological structures like parasite eggs, spores, pollen, etc., that can be collected in archaeological materials. Tools such as tweezers, scissors, swabs and scalpels may not be able to capture them, especially if the material to be sampled is trapped in textiles, inside the roughness of irregular surfaces, or even in the holes and gaps of mummified packs. The use of the conventional devices described above to collect multiple samples demands multiple sterile devices and specific storage procedures. In order to save time, preventing cross-contamination and improving the collection of pulverized samples in different conditions an adapted mini vacuum cleaner (MVC) was developed and tested in a recent study that aimed to evaluate the fungal contamination at two Egyptian mummies from National Museum of Rio de Janeiro – Brazil.

The adaptation consisted of adapting a connection tube to the vacuum cleaner in order to use disposable pipette tips protected with cotton pellets inside to do the sampling. Disposable urethral catheters were connected at tips when necessary, to sample inside narrow spaces. From 20 samples collected from bodies with conventional devices and mini vacuum cleaner, 12 fungi strains were isolated and 7 different fungi genera could be previously identified. Of these, 13 samples were aspirated by vacuum cleaner from surface and small gaps on both mummies and from the plastic capsule was keeping the mummy of Hori, allowing isolate 8 fungi strains belongs to 5 different genera, as *Cladosporium* isolated from both mummies. However, 6 samples were negative to fungal growth.

The use of a vacuum cleaner seems to be a great deal better at collecting pulverized samples, due to its minimum contact with substrates, and the preservation of samples. Positive results for the fungal development showed that the use of the device did not affect the viability of fungal propagules, allowing their isolation and identification. We also observed time saving when a vacuum cleaner was used compared with conventional devices. New adaptations on vacuum cleaners could be necessary in the future to get more satisfactory and accurate results. Finally, the authors recommend the use of this device not only for mummies, but also for other archaeological materials.

## 88. The Royal Treatment: Conservation of archaeological material from Revolutionary War vessel *Royal Savage*

*Shanna Daniel, Kate Morrard*

In 2015, the Naval History and Heritage Command Underwater Archaeology (UA) Branch received the remains of ROYAL SAVAGE, a Revolutionary War vessel which sank in Lake Champlain in 1776 following service in the Battle of Valcour Island. UA archaeologists and conservators are employing a combination of traditional methods and modern technology to document, research and preserve this important piece of U.S. Navy history. UA conservators are also working to conserve

and re-treat more than 1,300 associated artifacts, employing spectroscopic and elemental analysis of certain components of the artifact collection to identify and help mitigate previous cleaning campaigns.

### 89. A SEM Study of Funori (Green material) to Consolidate Archaeological Papyrus

*Mohamed Abdel-Rahman, Ahmed Tarek*

Funori is a polysaccharide-based adhesive extracted from the red algae genus *Gloiopeltis* and it is generally used in the conservation of easel paintings for the consolidation of matte paint. It is appreciated in conservation since it does not change the optical properties of the consolidated materials and it seems to preserve its mechanical properties after ageing. Indeed, Japanese scroll mounters use funori to attach facing papers to paintings and to consolidate flaking paints. Seaweed is gathered, rinsed, and cleaned, then pressed and dried into sheets composed of interlocking yellow-brown strands. This seaweed is gathered in Japan and China, where it is called "Halio". The ancient manuscripts and more recent studies confirm the treatment of alga is simple and inexpensive, applied directly as protection of works (paper, textiles, wooden boards), or in provisional interventions, or again, to give the appropriate viscosity to other adhesives, rice starch and animal glues. The Funori is soluble in water and it's used as a consolidant in restoration because it minimizes the risk of optical changes including the unintended gloss, the formation of tide lines, darkening. The funori could therefore be considered a Green material, because it is of natural kind, versatile and easy to use. The advantage of using natural consolidants is that they are non-toxic products, and are more compatible with other fabrics than synthetic materials. The Ancient Egyptians used papyrus (*Cyperus papyrus*) as a writing material, as well as employing it commonly in the construction of other artifacts such as reed boats, mats, rope, sandals, and baskets. Although they are made from a plant, the very dry climate of Egypt has meant that many examples of papyri have survived from the past, but in bad condition. So it should consolidate by using an adhesive, it is prefer to be similar to the chemical composition for Papyrus like Funori; the mucilage extract is called funoran. The above-mentioned studies, however, do not seem to be accompanied by SEM (Scanning Electron Microscope). The variable pressure SEM technique proved to be particularly useful because it allowed for the direct observation of a non-conductive material such as papyrus, and its chemical characterization. For this reason, investigations were conducted by means of SEM microscopy, in order to deepen the knowledge already acquired on this type of material and to study the versatility and the behavior of this material at the micro-structure. Finally, The SEM Study showed that Funori has an adequate consolidate, as well as minimal interactions with the physical properties of the consolidated papyrus, such as color. Furthermore, Funori showed good stability after accelerated ageing and quite good performance in relation to biological colonization. Key Words: Funori, Green material, consolidate, Papyrus, SEM (Scanning Electron Microscope).

### 90. Preservation and Management of the Collection of the Museu da Vida (Museum of Life)

*Mayara Manhães de Oliveira*

For more than a century, the Fundação Oswaldo Cruz (Oswaldo Cruz Foundation - Fiocruz) has pieced together a collection with significant

cultural value and a strong institutional identity, recognized as a heritage of Brazil's science and health. The collection is diverse in nature, with architectural, urban and archaeological, archival, bibliographic and museological items that serve as testimony of the social, political and historical processes of these fields. They are currently being preserved, researched, and published, to the benefit of the Brazilian society, by the Casa de Oswaldo Cruz (House of Oswaldo Cruz - COC), a technical-scientific unit created with this purpose, in 1986. In recent years, the COC have made efforts to be a reference in the current scenario of the heritage field, as well as to discuss and propose practical and sustainable solutions for collections. One of the results is the Preservation and Management Policy for Cultural Collections in Science and Health (Política de Preservação e Gestão de Acervos Culturais das Ciências e da Saúde), which defines preventive conservation, integrated conservation, risk management, heritage education, research and technological development as its core guidelines, ensuring society's accessibility to its heritage now and in the future. In 2010, the project of the "Complex for the preservation and dissemination of the scientific collections of Fiocruz" ("Complexo de preservação e difusão dos acervos científicos da Fiocruz") was selected in a call for proposals from the Brazilian Bank of Economic and Social Development (BNDES). The final results of this project are the installation of multi-user platforms for the scanning and reproduction of images from the collections, and the installation of security equipment for fire detection and firefighting in the areas where the collections are kept. This work focuses on the project's actions related to the museum collection. The goal was to adapt and equip the building where the collections are located. Some interventions were made in the collection areas to ensure its correct storage, safety from fire, weather and vandalism, appropriate room conditions, and a safe and adequate flow of objects and people. As a result, we have: the installation of a fire detection and firefighting system, a security system with cameras and sensors, low-cost and efficient air conditioning, a well-structured conservation room, with appropriate equipment and furniture suitable for storing the objects. Finally, this work also aims to present an analysis of the impacts of this new infrastructure in the preventive conservation of the museum collection.

### 91. An Alternative Approach to Ink Corrosion: Biosorption

*Gizem Erdem, Rumeysa Ozen, Yasemin Unlu Yukus*

Active treatment of ink corroded manuscripts has been a bottleneck for conservation throughout many years. Although there are many applied treatment methods including tap water, magnesium carbonate, calcium phytate combined with calcium bicarbonate and etc., no biological methods have been revealed and studied yet. Biological treatment methods are open to improvements regarding genetic and protein engineering and therefore can be adaptable to specific conditions. It is known that degradation of paper because of ink corrosion is mainly caused by two reasons: oxidative degradation of paper due to the free iron ions and acid catalyzed degradation of paper in the presence of acid. But also it has been proved strongest effect on deterioration caused by the radical mechanism catalyzed by iron (II) compounds regardless of pH of the medium. For that reason, this study focuses mainly on adsorption of iron ions. In this study biosorption, which is a biological method using dead microorganism as a sorbent for free metal ions, was conducted to be an alternative treatment for ink corrosion. A well-known biosorbent of iron ions *Acidithiobacillus ferrooxidans*

was chosen. Non-sized Japanese paper was selected for experiments. To prepare ink a typical iron excess mixture, with a molar ratio Fe: Tan of 5.5 : 1 was chosen to be applied on paper specimens including control samples. The next step after pre-aging of paper specimens is batch type biosorption procedure at specific temperature, pH and biomass concentration. Remaining free iron ion concentration was planned to be calculated using analytical techniques. Immediate side effects during and after treatment will be evaluated visually by conservator. This is a promising method with non-toxic side effects and can be regarded as the first step of biological approach to ink corrosion treatment. Support of Directorate of the Turkey Institution for Manuscripts is gratefully acknowledged.

## 92. Chemical Cleaning and Intervention Criteria in a Brass Dial Clock from the XIX Century

*João Henrique Ribeiro Barbosa, Luiz Antônio Cruz Souza*

This study presents the intervention criteria chosen for a chemical cleaning in a brass dial clock from the XIX century. This item belongs to the Abílio Barreto's Historical Museum settled in the state of Minas Gerais (Brazil). Usually, clocks are complex objects composed of many devices and different materials. However, in this case, all the mechanisms were lost, but the dial clock was preserved. In the past, the clock had a decorative and functional value and was used to measure the time. Nowadays, the dial clock holds a historical value and is important as a document. It provides historical evidence of Brazilian techniques in clocks and metals during the XIX century (forging, chasing and engraving). This clock also improves our knowledge about people and objects of the past century. This single piece holds many singularities which suggest it was handmade. It has a break arch type, a cartouche with personal inscriptions, a chapter ring with carved roman numerals and other unique decorative marks.

In the brass surface, a passive and stable cuprite layer was formed. However, low relief marks were covered by white cleaning residues. Probably a result of a past intervention, this material was reducing the contrast between low relief areas and the metal. The white residues were identified using EDXRF and FTIR. The analyses suggest a calcium carbonate composition, similar to those used in commercial mechanical cleaning products. Local cleaning tests were performed in some areas with sodium citrate in order to know how the surface was below the white residues. As a result, green corrosion products were found. They were magnified with a microscope and visually characterized as active corrosion products. The support has losses and dents. In the back of the plate, there is a thick surface made of grease and corrosion products with many scratches. These abrasions suggest past mechanical structures which once were in contact with the back of the plate.

Our intervention plan consisted of removing white cleaning residues as well as green corrosion products formed beneath them. This decision was made once the clock is now understood as a historical document and for that reason, it should gather a better visibility and legibility. The white residues were removed with a solution of sodium citrate in water (1%), first using a swab and then from the irregular surfaces with an adapted toothbrush. After that, the green products were removed with a sodium diethyldithiocarbamate solution (0.1 mol.L<sup>-1</sup>). Finally, the dial clock face was covered with a microcrystalline wax surface (paste) in an attempt to avoid moisture attacks. Structural damage, losses on the support, and scratches in the back of the plate were preserved because they are associated with the history of the clock.

## 93. Conservation Challenges in Digital Collections: The importance of documentation and value recognition procedures - the case of Family Album collection

*Ximena Paola Bernal Castillo*

Family Album (Álbum Familiar) was born in 2006 in the Museo de Bogotá, with the objective of creating the largest photographic city collection through the ongoing donation of images (digital copies) from the citizens' family albums. In Family Album the donors recall, tell and share something about each picture, making images remain in the present in a lively manner, thereby generating strong links between people, photos and stories. In addition, the project methodology involves capturing feelings, to the point that people laugh and sometimes cry when talking about their pictures. As a project/photographic collection, Family Album crosses the field from the intimate to the public, generating common identification relationships that allow Bogotá's citizens to recognize themselves in terms of history and ways of living in a shared territory. Today, Family Album contains more than 5000 images. It is a unique collection for two reasons: on the one hand, this project is a collective creation constructed by the participation of more than 4,500 people/donors that have given digital copies to the museum, starting a decade ago. This means that if the museum does not take preventive conservation measures, in case of damage or loss, there will not be a chance to recover the entire collection because of its multiple origins, and because of the nonexistence of negatives or positives of this pictures at the institution. On the other hand, Family Album suffers from the effects of the confrontation between History and Memory. That means that in an initial stage of the project, the memories of the contributors were not recorded in the database because they were not considered important. Starting in 2009 we have included them in the documentation procedures looking for a real articulation of these memories with history, and to achieve a comprehensive look and meaning of this collection. The conservation of this digital collection depends on two priority steps: value recognition and documentation procedures. The Museo de Bogotá is a city public institution that does not have state of the art technology, neither a staff trained specifically in digital collections conservation. Despite these obstacles, knowing about the value and the importance to this collection, will allow the Museo de Bogotá to develop a long-term digitalizing protocol and to look for a formal back-up for this project. The position taken for the documentation is the other priority for Family Album conservation. There is a need for this cultural heritage collection, to intertwine the memories of the donors with history facts. This means that as conservators, we are not just conserving images, but also its intangible content putting together facts of history and donors' memories. Bogotá, as a city that receives people from all over the country, its inhabitants need a sense of belonging connected with recognition of its cultural heritage. Family Album is a perfect venue for achieving it. Because of this, there must be an ethical element in the conservation of this digital collection, and a challenge in finding the best way of documenting it.

## 94. Fill in the Gap: The challenge of bringing the lab to the building being restored

*Marcela Lydia Cedrola*

The National Congress is a building that houses the Chamber of Deputies and Senators of the nation representing the legislative branch.

It occupies more than 2.4 acres. Its construction began in 1897 and was completed in 1914. The building is of a Greco-Roman eclectic style and is currently declared a National Historic Monument. This complex was built and decorated with the best materials available at the time; many of those materials were brought to Argentina from Europe. Thus we find much varied and valuable assets that need to be preserved, among which we can mention marbles from Belgium and elsewhere in Europe, Boiseries of Italian walnut, German ceramics from Villeroy & Boch, sculptures of Carrara marble, gilt ornaments, stucco and false finishes that simulate marble. Stenciled mural paintings and paintings on canvas, crystal chandeliers, wooden furniture, historic floors and magnificent stained glass windows. For many years, the building was neglected and without maintenance, therefore many of these precious materials suffered wear and damage or simply were painted over with modern paintings that hid the original materials to adapt to more modern times at the whim of the political authorities in power. In 2010, a small team under the restorer Nora Luzzi, head of the Department of Restoration and Museums, began the task of restoring the Chamber of Deputies. Little by little specialized teams of restorers were formed to treat each type of material and recover its former glory. The team grew to 120 people as the needs of work arose. The teams were made of specialized restorers in murals and easel paintings, wood, textiles, stained glass, stone, tile mosaics and historical, metals and stucco, as well as specialized architects in restoration and photographers. In 2014 I joined this team, to be in charge of an "in situ" laboratory in order to assist directly and immediately all requirements that could arise in the work "on the field." In this laboratory, analytical work is done to determine the nature and composition of the original materials, as well as existing pathologies found. Once identified, intervention processes are proposed, formulated by the laboratory, and if necessary, the laboratory prepares the specific compounds for the proposed intervention. Thus the laboratory, which often is isolated from the restoration work in the field and far from the restorer, in this project it is working alongside with the team and is a fundamental part of the intervention process.

### 95. Conservation of Evidence: Howard Carter's journals, the *Morning Post* and *Egyptian Gazette*

*Nagm eldeen Morshed Hamza*

Tutankhamun is famous throughout the world for the wealth of the objects found in the pharaoh's tomb, objects which can be seen in various galleries of the Egyptian Museum. Numerous books have been written about the golden treasure, but no one writes about the materials from Howard Carter's diaries and journals. Carter used in his everyday life inside the tomb some materials and boxes to help him in packing and transportation of objects from the tomb to the Egyptian museum at Tahrir. All the materials which Carter used in the excavation have a historical context with the archaeological objects from the tomb, such as the newspaper, boxes and numbering cards; all these materials tell rich stories about the everyday life of the excavators. The newspapers which Carter read were the *Morning Post* and *Egyptian Gazette*; after Carter read them, he used them as packing materials or supports to transfer the textiles of the king from the tomb to the Egyptian museum at Tahrir. Before using the newspapers, Carter cut them into different pieces to transfer textile objects from Egyptian museum to The Grand Egyptian museum. The aim of our research is to study the historical context of the newspapers and conserve them as apart from the history of the tomb. We received the textiles in our

museum GEM-CC and started to document all pieces of newspaper with the textile objects which transferred with it; one of the most interesting things was that the numbering cards were attached to the pieces of newspaper. On the other side, we searched the date of these newspaper and found that these dates correspond to interesting events inside the tomb. Also, we started to collect the pieces which were cut from one newspaper. From the conservation view point, we studied the yellowing of the newspaper which gives us accurate assessment to the condition of the storeroom of Egyptian museum at Tahrir, which we can use to measure the amount of changes of the newspaper from its original color to the yellowish color. New mounting will be made to the pieces using acid free cardboard.

### 96. Michigan Papyri Fragments from Excavations to Display: Egyptian Museum of Cairo

*Sara M. Nour*

The Egyptian Museum of Cairo possesses one of the most important collections of papyri in the world. University of Michigan's excavation collection is one of its valuable collections, swept away from sandy Egyptian archaeological excavation sites in the 1920 – 1940, inspired by Francis Willey Kelsey\*. The Michigan papyri housed today in the Egyptian Museum were excavated by American archaeologists of the University of Michigan (Ann Arbor) between 1924 and 1926 in the Graeco-Roman village of Karanis, in the north-western part of the Fayum. The Michigan papyri contain literary as well as documentary texts which shed new light on the life of the people who lived in Karanis in the 2nd century CE. This collection contains fascinating personal letters, school primers, medical texts, sales contracts and items illustrating every-day life. Because papyri are considered objects of special value, due to their historical value of the writing contents and being an archaeological artifact at the same time, the collection is a rich source for study and publication by Egyptologists and papyrologists. This paper aims to illustrate the conservation treatments (disinfection, documentation, restoration process, and re-housing) of some special fragments which were mounted in different kinds of beautiful old cigarettes boxes, wooden and metallic boxes with few numbers of very good-packed envelopes, and remounting them between two sheets of glass in order to make them available to students and scholars in order to facilitate the studying and publishing of them. Keywords: Papyri; Michigan University; excavation; Egyptian museum; historical value; conservation treatments; disinfection; documentation; restoration process.

### 97. Advances in State-of-the-Art in XRF Elemental Analysis for Art Conservation

*Dr. Lee Drake, Dr. Bruce Kaiser*

Over the past 15 years, there has been a continuous improvement in state-of-the-art in XRF elemental analysis for art conservation commercially available to the conservation scientist. And, this past year, another significant step has been taken. This paper will provide a detailed and insightful summary of just what current "state-of-the-art" available to all conservation teams means, with specific examples highlighting each application for each area of conservation including all types of paintings, bronze or other metals, ceramics, glass, paper, fabric, literally any material of interest. Limits of detection from Ne to U, thickness and depth analysis, paint layer detection and determination,

object scanning and elemental imaging, corrosion and contamination analysis will all be covered, highlighting the exciting advancements in these areas. This is a very important tool for all conservators. It is fundamental they all know what is now available to them in order to have the most advanced tools in their vital work of maintaining the human race's most important treasures around the world.

### 98. Performance Evaluation of UV Inhibiting Acrylic Resin Coated Glass with Modern and Historic Glazing Systems

*Andrew Fearon, Janelle Elyse Sabutski*

UV radiation is the single largest contributing factor in fading of interiors including fabric, carpets, other furnishings, and art, and accounts for approximately 40% of all fading damage. Thus, photo-degradation must be arrested to maintain the integrity of historic materials and finishes. The n-butyl acrylate methyl methacrylate copolymer emulsion with hindered amine light stabilizers (HALS) and ultraviolet light absorber (UVA), GOLDEN MSA, which is tested here is marketed as an art varnish compatible with various types of paint. Brush and spray applied to modern and historic glass, the coating was weathered in a controlled lab setting on mock-up windows in a Q-Lab QUV weathering machine and in the field on skylights at Eastern State Penitentiary (ESP) in Philadelphia. The coating was unconventionally applied to the exterior surface of the glass with various glazing combinations. After 1 year at ESP and 900 hours in the QUV, positive results proved the coating's efficiency in blocking UV radiation. The UV readings, obtained by an ELSEC Environmental Monitor Type 765, at ESP decreased, due likely to environmental accumulation which scatters incident light waves, while readings slightly increased in the lab samples. Both values are a marked improvement to pre-coating values and these experiments demonstrate the versatility of the product for an array of material combinations. Quantitative data was supplemented with qualitative blue wool exposures and time-lapse photography.

### 99. Impact of Gaseous Pollutants in Silver Artifacts Corrosion

*Yussri Salem*

This work aims to study the impact of gaseous pollutants in silver artifacts corrosion. The study will be carried out on manufactured coupons of silver alloy (91 silver, 9 copper) and have chemical composition similar to ancient Egyptian silver artifact. These coupons will be exposed to gaseous pollutants, each gas alone, including Sulfur dioxide, Nitrogen dioxide, Carbon dioxide, Chlorine, Hydrogen sulfide, Hydrogen chloride. The exposure period will be four weeks in climate chamber at concentration 500 PPM. Impact of each gas is evaluated, the morphology of the corrosion layers is described, corrosion products are analyzed and many examinations using microscopes (SEM, PM, SM, AFM) were used. Results reveal that gases, except carbon dioxide, react with the surface of the samples and form a black layer varied in density rate; analysis results also reveals Ag<sub>2</sub>S, AgCl as corrosion products.

### 100. Studying the Manufacture Technology on Tutankhamun's Leather Cuirass

*Islam Abd el Maksoud Shaheen*

One of three extant examples of leather scale armor have been found in the Ancient world was found in Egypt in King Tutankhamun's tomb. The only item of true body armor recovered from the tomb was a close-fitting leather cuirass, found in a crumpled up state in box 587 in the Annex. It is described by Howard Carter as "made up of scales of thick tinted leather [perhaps red and yellow] worked onto a linen basis, or lining, in the form of a bodice without sleeves."

Our first examination of Tutankhamun's cuirass show that it is constructed from small pointed scales that are laced together into rows which were then stitched to backing material formed of six layers of very finely woven linen. The study examines a number of the loose scale to assess the condition, discusses the difference between painted rawhide and tanned leather, and identifies the tanning and coloring agents used in the cuirass. To find more interpretations for the chemical changes which have been happened to the cuirass, we studies the characterization of tanning and coloring agents and their effect on the thermal stability of leather. From this goal, our study began using scientific analysis focused on assessing the development of the technology of ancient Egyptian and its effect on chemical changes on leather using A Dino-Lite Digital Microscope (USB) to talk all measurements, Multi-spectral imaging (Ultra Viol (U.V) and Infrared (IR)) are used for documentation the fluorescence of tanner and color of the cuirass. Scanning electron microscope (SEM) to obtain a more detailed observation of the condition and physical characteristics of the leather. Fourier transform infra-red spectroscopy (FTIR) was employed to analyze the various components of the material. Handheld X-ray fluorescence XRF is used also for Identification of the process of making and what the materials are used to scrap the hair also XRF is used to identification the element of the coloring agents. Various archaeological leather samples from Tutankhamun's collection were investigated to use as a reference to identify the leather species of the cuirass.

### 101. The Preservation of Mummy Bundles in Peru: A methodological proposal

*Selene Isabel Figueroa Cueva*

The Arturo Jimenez Borja-Puruchuco Site Museum holds an important collection of mummy bundles, dating from different archaeological campaigns conducted since the 1960s. The mummy bundles came from various archaeological sites East of Lima, such as Puruchuco-Huaquerones, Rinconada de la Molina, Cajamarquilla, Pedreros, and Huanchihuaylas.

We made a diagnostic study of the risks to which the collection was exposed; resulting in the identification of risk levels for each agent of decay. Based on these results and some particular characteristics of the collection, a methodology was devised for gradual implementation, according to available resources. Fortunately, in 2014, the museum was awarded the US Ambassador's Prize, which was applied to preserve, among other assets, the museum's valuable mummy bundle collection. This grant helped to speed up the process over 2015.

The applied approach considers that each bundle resulted from of a process in which layers of textiles, ropes, cotton balls, and other items

were organized around one or more deceased individuals. We suggest there were different stages during the process of wrapping. Additional elements, such as “false heads,” clothing, wigs, and other accessories had also been added over the original mummy building process. Direct observation helped to characterize outer and inner wrapping items, the latter only visible in bundles with broken outer layers that allowed to see them. Direct observation then also helped to reconstruct the original technique of placing wrapping and packaging items; therefore identifying different types of elements used by ancient Peruvians, probably dependent on chronological, chorological or other aspects or social origin.

Conservation of mummy bundles comprises Preventive Conservation, which requires building a documentation corpus, along with the design and development of storage items, including shelves, and climatic monitors. Micro climatic monitoring is carried out before, during, and after curative conservation. On the other hand, Curative Conservation, refers to the intervention actions that are performed directly on the cultural items with the aim of stabilizing them. However, the conservation approach proposed is not only the physical preservation of cultural property, but also the preservation of inspiring knowledge useful to society. This wider goal is achieved through dynamic activities and workshops, generating life experiences that link our past to the present. Therefore, the proposed conservation of mummy bundles at the Museum of Puruchuco encompasses a continuous technical, investigative, and educational process; considering an integrated conservation of cultural goods aimed at the community.

## 102. Packaging Systems for Pre-Hispanic Mummy Bundles in Peru

*Rubén Héctor Buitron Picharde*

Mummy bundles represent a mortuary treatment used from very early times, a pre-Hispanic historical process in Peru. The production of mummy bundles was developed over time, depending on the geographical location and level of economic development of societies, so mummy bundles vary and can be larger in size and weight; some may reach 2 meters long and exceed 70 kg (154 lbs). This complexity brought a set of deterioration agents and a great challenge for preservation. One of the most damaging agents is physical force, specifically improper handling. For this reason, in the Site Museum Arturo Jiménez Borja-Puruchuco, we developed a set of packaging systems according to the characteristics and needs of each mummy bundle, for the purpose of significantly reducing these risks, within a preventive and curative conservation methodology.

The Puruchuco Museum is one of the cultural institutions with one of the most important collections of mummy bundles in Peru, an ideal place to develop this proposal.

Considering size, weight, state of conservation and structural stability of the mummies, we have designed and developed three packaging systems. The system type 1 is for small mummy bundles; it consists of a polyethylene foam support and a box of polypropylene. The system type 2 is for medium size and weight; it consists in of a polyethylene foam support with internal aluminum structure and polypropylene cover. Finally, the system type 3 is designed for mummy bundles of large size and weight, reaching 2 meters long and 70 kg. This system has two subtypes: horizontal and vertical. The structure of this system was worked entirely with austenitic steel and was complemented with other stable materials. The systems were designed

considering a set of possible future actions such as transport, analytical studies and research in general; so they are reversible, easy to carry and protect the mummy bundle from external agents. The development of the packaging system for the pre-Hispanic mummy bundles represents a pioneering technological proposal pioneer in Peru, that has managed to stabilize and reduce the risks of direct manipulation. Therefore, the proposal represents a successful precedent for the mixed cultural heritage conservation of large format in Peru.

## 103. Mend or Historical Evidence?

*Alicia Nathalia Cañiza Pereida, Urani Correa Pérez, Valeria López Mancera, Inés del Ángel Mejía Martínez, Rosa Lorena Román Torres, Ana Julia Poncelis Gutiérrez, Martha Contreras Sainz, Abner Gutiérrez Ramos, Nicolás Gutiérrez Zepeda*

The shirt General Francisco Villa wore the day he was murdered in Parral, Chihuahua, on July 20, 1923, arrived at the Textile Conservation Lab of the National School of Conservation, Restoration and Museum Studies (ENCRyM) “Manuel del Castillo Negrete,” for study and conservation treatment as part of an academic process. The garment is now part of Mexican cultural heritage because of its important relation to one of the highest representatives of the Mexican Revolution, and because it is direct evidence of an important moment in the history of Mexico.

At the time of Villa’s autopsy, his clothes were removed and handed to Austreberta Rentería, one of Villa’s wives. Conflicts emerged after the general’s death, due to personal interests and government and legal issues, among others. These clothes were the only tangible possession that Austreberta could keep in remembrance of the man she loved. It is believed that as an act of affection, she washed and mended the shirt trying to minimize the traces of blood and the evidence of bullets that ended their history together, thus becoming a sentimental keepsake for the widow of the leader. In 1965, she donated the clothes to the National Museum of History.

During the study of the shirt, a theoretical discussion took place at the ENCRyM: whether to respect the second historicity of the piece by not removing the seams made by Villa’s wife, or to remove them to highlight the historical facts. As conservators and restorers we confronted the disagreement weighing values of intervention and evidence. After the analysis of the case from various theoretical positions, a proposal for the intervention was developed, based on values and needs, taking into account Villa’s life trajectory and context.

## 104. The Use of CT Numbers to Quantitatively Classify Cultural Heritage Materials

*Brittany Dolph Dinneen, Dr. John A. Malko, Renee A. Stein*

Conservators routinely document the structure of objects for the purposes of condition assessment, technical study, and treatment decision-making. X-radiography has provided conservators with the ability to generate images of otherwise inaccessible features such as closed cavities, internal armatures or other structural features of solid objects, in a nondestructive way. Computed tomography (CT) scanning provides an additional level of information, emitting x-rays in multiple planes and acquiring data at multiple angles to produce a three-dimensional reconstructed image, whereas the X-radiograph results in

an image in which the three-dimensional information is superimposed into a two-dimensional format. In both X-radiography and CT scans image contrast, that is, areas of differing brightness, are related to the differences in X-ray attenuation (radiodensity) of the regions through which the x-rays travel. In X-radiography the superimposed nature of the image makes quantitation of radiodensity difficult. In CT scanning regions of the scanned object can be quantified by their radiodensity; this quantitation uses units called Hounsfield units, or CT numbers, which describe the radiodensity of a given volume relative to air (-1000) and water (0).

In spite of the proven capabilities of CT scans for imaging, however, scan output may still not provide enough visual evidence of morphology to characterize a material. Furthermore, visual interpretation of radiodensity is typically only semi-quantitative at best – allowing for only qualitative comparisons - and dependent on the parameters of the scan. We suggest that if the relationship between x-ray attenuation and material class is significant, the identification of a material or class of materials would be informed by comparing the assigned radiodensity of a determined region of interest to a table of known ranges for various cultural heritage materials (i.e. ceramics, stone, soil, clay, cellulosic organics, keratinous organics, etc.). Similar tables developed for medical diagnostics include CT numbers for fat, blood, muscle, gray and white brain matter, and different types of bone.

Potential applications include the characterization of materials in hidden cavities which may be unethical to open, or impossible to access, without irreversibly disturbing the exterior matrix. For example, many African power objects, such as minkisi, contain materials in bundles or otherwise hidden spaces. Other possible applications may be the material characterization of amulets hidden in mummy bundles and sealed opaque vessels with contents intact.

### **105. String Theory: An innovative insert for the treatment of Yves Klein's Untitled Pink Monochrome (MP 21), 1961**

*Kristin Robinson*

The underbound paint surface of a Yves Klein monopink painting dating to 1961 presented a unique treatment challenge, inspiring the conservators at Cranmer Art Group to pursue a better understanding of the artist's intent and process, while searching for a compensation technique that would avoid saturating the paint surface. Research, careful examination, and pigment analysis led to a better understanding of Klein's materials and technique, and the demands of the conservation treatment prompted reaching past the traditional toolbox.

Klein, a deeply religious artist in constant pursuit of symbolism and meaning in his work, strove to capture the luminosity of pure pigment on his monochrome canvases. Pink was the final color established in his monochrome series, which include his IKB ultramarine blue monochromes and monogolds. The texture of his monochromes is often varied, indicating an exploration of application method. But while the blue monochromes remain consistent in tone, the monopinks, based on Madder rose pigment, appear to vary widely in tone. MP 21 falls in the darker range of his monopinks, and examination revealed a mixture of both light and dark pink pigment clusters. A better understanding of this variation in pink tone will be achieved through pigment analysis.

An open crack through the upper right corner of MP 21 painting

presented a visual blemish and threatened the structural integrity of the object. A previous conservation attempt illustrated that traditional means of compensation would not be satisfactory. By expanding upon the idea of an insert, a solution was derived that involved laying a sewing thread coated with sturgeon glue and crushed soft pastels into the crack, thereby filling and inpainting the loss at once, while establishing an avenue for future reversal if needed.

The goal of this poster will be to introduce Klein's commitment to pure pigment and to outline the conservation approach to this austere medium, and consider its successes and shortcomings, and to share any information on Klein's materials, application technique, and aging properties collected from technical analysis and research.

## NOTES

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Image: GCI's Managing Collection Environments Initiative project team is undertaking a long-term study to better understand the response of hygroscopic materials to climatic fluctuations at both the micro and macro scale. One of the tools they are using is the nano-indenter, which measures mechanical properties of sub-millimeter samples of historic materials.

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