

# CONSERVATION CONTINUUM

examining the past *o* envisioning the future

AMERICAN INSTITUTE FOR CONSERVATION  
OF HISTORIC AND ARTISTIC WORKS  
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ABSTRACT BOOK

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AMERICAN  
INSTITUTE FOR  
CONSERVATION  
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ARTISTIC WORKS

## ABSTRACTS 2010

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 (FAIC) supports the preservation of cultural materials through education and research initiatives for conservators and allied professionals. FAIC advocates public appreciation of conservation and the primary role it plays in increasing understanding of our global cultural heritage.

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## GENERAL SESSION

### IDENTITY CRISIS—CRITICAL IDENTITY: THE FUTURE OF CONSERVATION AND THE ROLE OF AIC IN ITS DEVELOPMENT

*George Wheeler, Director of Conservation, Columbia University*

In recent years three texts have appeared that explore conservation theory: *Contemporary Conservation Theory* (Salvador Muñoz-Viñas, 2005), *Theory of Restoration* (Cesare Brandi, English translation, 2005), and *Securing the Past* (Paul Eggert, 2009). An informal survey of the American conservation community indicates that these texts have gone largely unread (many of Brandi's most important thoughts appear in *The Historical and Philosophical Issues in the Conservation of Cultural Heritage*, published by the Getty in 1996, which has been more widely read by conservators). All three texts emphasize that conservation is a critical, interpretative act, most clearly and explicitly stated by Brandi, "...restoration is carried out in order to re-establish the critical text of a work [of art] and not simply a practical treatment in itself." Fully accepting conservation as a critical act, Eggert challenges conservators to become more aware of developments in critical theories in other disciplines in a manner similar to Dykstra in his 1996 article, "Artist's intentions and the intentional fallacy in fine art conservation." Eggert further emphasizes that to be unaware does not lead to being uninfluenced by these critical theories. However, the fundamental difference between conservation and other disciplines is that its critical, interpretative acts are carried out on physical objects, and not just any physical objects, but unique works of art. Thus, it is not enough to think well and critically in the conservation process, the conservator must also be able to act well—to have the skill to execute conservation treatments. The success of conservation treatment resides at this juncture between thought and action.

Also in recent years, the AIC has devoted significant energy to the exploration of a professional certification process, an exploration that the membership convincingly chose to terminate. However, it may be fruitful for the AIC and its membership to view the pursuit of a certification process not as a failed endeavor but the beginning of a new kind of conversation about definition, identity, and creation of a more intimate connection between thought and action, theory and practice in conservation. Indeed, Muñoz-Viñas urges the AIC in this direction by highlighting its definition of conservation as, "The *profession* [author's italics] devoted to the preservation of cultural property for the future." Conservation is surely more than a profession; it is also a set of activities including ways of thinking about, looking at, and acting on cultural property. This presentation attempts to extract core arguments from the certification discussion and re-position and re-focus the arguments from professionalism and external validation to the development of conservators' critical capabilities towards building a firmer platform to interact with curators, architects, engineers, scientists, and administrators.

### WITH PATIENCE AND FORTITUDE: KEEPING CONSERVATION RELEVANT IN A CHANGING INSTITUTION

*Shelly Smith, Head of Conservation,  
The New York Public Library*

The New York Public Library (NYPL) is in the midst of an ambitious restructuring aimed at merging the historically separate Research Libraries and Branch Libraries. This system-wide organizational change, coined "One NYPL," includes broad initiatives such as creating a unified online catalog for all collections, extensively renovating existing and new library buildings, and re-evaluating and reasserting the Library's mission.

This reorganization has affected conservation at the Library in numerous ways. In the past, conservation treatment was done in smaller satellite operations focused on a single curatorial department or in response to exhibitions. Under the aegis of the "One NYPL" reorganization, all conservation activities have been centralized into one department. The conservation department once served only the Research Libraries, four research centers containing over 44 million items (rare books, manuscripts, prints, photographs, maps, paintings, objects, archives, and more). The department now also serves the "permanent collections," of the Branch Libraries, 85 neighborhood libraries serving The Bronx, Manhattan, and Staten Island. In February 2010 the conservation department will move to a new laboratory facility in a service-dedicated building that is located miles away from the facilities where collection materials are stored. In addition, the Library created a new mission statement with a focus on public service, education, and outreach. This new mission statement is disconcerting for conservation staff because the word "conserve," present in the previous mission statement, has disappeared from this modern version. Determined not to let conservation disappear from the Library's mission, the conservation department endeavored to re-envision its place and relevance within the institution.

Many questions have been raised in the process: What do conservators do, and how do we make these activities more visible, both within the institution and to the public? How does conservation interact with the many disparate parts of the Library organization? What can conservation do to participate in the institutional focus on public service, education, and outreach? How can an institution with nearly 50 million items adequately allocate its limited resources? How do conservators serve the institution's collections from a distance? How do cultural institutions value conservation?

This presentation will examine the ways that the conservation department at the New York Public Library has attempted to answer these questions, and what new activities and initiatives have been introduced or planned as a result. Topics that will be discussed include collaborations with exhibitions, education programming, and digital initiatives; using current web-based technologies such as videos and blog posts to create original content that illuminates both

conservation and the Library's collections; creating public programs on conservation topics; providing educational opportunities for conservation students and continuing professionals; creative fundraising strategies; and institution-wide outreach. The challenges the NYPL's conservation department faces are relevant to our colleagues and might provide a springboard for further discussion.

## THE EVOLUTION OF ENVIRONMENTAL STANDARDS: THE STRUGGLE TO QUANTIFY AND SIMPLIFY RISK IN A COMPLEX WORLD

*Steven Weintraub, Art Preservation Services*

Over the course of the 20th century, there has been an increasing awareness regarding the impact of environmental factors such as temperature, relative humidity, light and pollutants on the preservation of cultural artifacts. At the same time, technological advances have provided tools to improve the ability to control these environmental factors. As a consequence, a variety of recommendations for environmental control developed within the museum community.

In time, the concept of environmental control evolved from a series of general "common sense" recommendations into a defined list of tightly quantified environmental requirements. This transformation came about because of a number of developments. Key among them are three factors:

1. The increased popularity of museums among the general public: this fueled a rapid expansion of existing museums and a surge of new museums throughout the world. New construction required that conservators provide mechanical engineers with precise environmental specifications needed to design HVAC systems.
2. The parallel growth of museums and conservation training programs: this combination resulted in an increased conservation awareness and a large number of permanent conservation staff positions within museums. Conservators became strong preservation advocates, and fought to improve environmental conditions.
3. The growth of large international traveling exhibitions: the rapid increase in the number of traveling exhibitions extended the awareness of environmental standards, since many museums began to require tight environmental conditions as a precondition for lending artifacts.

Within the last decades of the 20th century, as the price of energy and construction continued to rise, some members of the museum community began to reassess whether current environmental standards were necessary and justifiable. Presently, with a new global awareness and interest in sustainability, the need for reassessment and loosening environmental requirements is gaining traction.

When developing or reconsidering environmental requirements for preservation of cultural heritage, it is essential to understand the concepts that resulted in the original recommendations, as well as how and why they evolved the way they did. It is an interesting and an important story that can tell us how to avoid mistakes of the past as we plan for the future.

This presentation will provide a brief summary of the historical evolution of environmental standards. The emphasis will not be on the numbers so much as the ideas behind the numbers. In part, a reassessment of environmental standards and risk is long overdue as well-intentioned recommendations have atrophied into excessively rigid prescriptive requirements.

Novel ways of analyzing and rethinking fundamental ideas that gave rise to environmental standards will be discussed. Hopefully, such a reassessment will provide a more rational basis for reconsidering how environmental standards should be modified and implemented. A key point is to avoid oversimplifying solutions so that they no longer make sense in an increasingly complex world.

## P<sup>3</sup>: PEN, PRESERVATION, POLITICS— ESTABLISHING A LONGITUDINAL STUDY FOR THE EXHIBITION AND STORAGE OF HERBLOCK DRAWINGS

*Fenella G. France and Holly Huston Krueger, Library of Congress, Preservation Directorate*

Herbert Block (Herblock), four-time Pulitzer Prize winning cartoonist, was a seminal figure in the political landscape for most of the 20th century. In 1946, he joined the Washington Post as its editorial cartoonist and remained until his death in 2001. The Herblock Foundation donated his entire collection to the Library of Congress including 14,400 original drawings for his daily published cartoons as well as 50,000 rough sketches. The Instrument of Gift stipulates that the "entire collection must be made public" and "the Library will provide space in the 1897 Thomas Jefferson Building for a permanent, distinct and autonomous public display of cartoons..." Herblock was remarkably consistent throughout his career in his choice of working materials. The finished drawings were executed in a limited range of media on a textured layered commonly known as coquille board, often loaded with optical brighteners. Opaque white media was used as "correction- fluid." From his earliest cartoons until the mid-1970's, Herblock began his drawing with a light sketch in graphite, then drew the image in India ink with pen and brush, followed by shading with graphite media. Except for the optical brighteners, these drawings were comprised of relatively stable materials. During the mid-1970's he began to incorporate blue "publisher" pencil, porous point pen, an unidentified black friable media instead of the graphite, and "Avery Labels," materials that present challenges for exhibition as well as storage. The exhibition celebrating

the Hundredth Anniversary of Herblock's birth presents an opportunity for the Preservation Directorate to better characterize these materials and effects of exhibition.

Developing a longitudinal study to assess long-term effects of exhibition and storage conditions was critical given the gift requirements of the collection. Research began with non-destructive characterization of component materials by hyperspectral imaging, to differentiate the spectral response of a range of media on the drawings. A selection of sample materials obtained from the artist's original palette provided a standard reference library of spectral responses of the media. Media samples demonstrated marked differences in spectral responses, also revealing artist changes, strike-through and fluorescence of specific media. Additional spectral data and analyses assisted characterization of material properties. Determining the light sensitivity of media and substrate is critical for determining the optimum conservation conditions for exhibition. Materials will continue to be monitored at set intervals both on and off exhibit enabling an assessment of photo, thermal and other degradative mechanisms that influence their chemical stability. Specific drawings were analyzed before, during, and after exhibition to provide baseline data for the longitudinal study. The research project requires the coordination of a range of personnel, divisions, instrumentation, and research methodologies over an extended timeframe to assess the impact of exhibition conditions and ensure the long-term stability of this collection. Balancing the requirements of the Instrument of Gift and conservation concerns requires further conservation knowledge be developed. Addressing the challenges of the increasing number of long-term exhibitions, and the limitations of an 1897 building provides the impetus for development of meaningful, long-term, ongoing research projects combining conservation and preservation research divisions.

## CHALLENGES OF SUSTAINABLE CONSERVATION IN THE 21ST CENTURY

*Patricia Silence, Conservator of Museum Exhibits and  
Historic Interiors, Colonial Williamsburg Foundation, and  
Chair, AIC Green Task Force*

Conservators have put much effort into understanding material deterioration, establishing standards for collections management and preservation. Stringent environmental conditions have been researched emphasizing preventive conservation through environmental control. A reassessment of current practices is essential for conservation to become more energy efficient and less waste producing. Conservators must work simultaneously to save natural resources while preserving cultural resources. It is time to take our understanding of preventive conservation one step further, examining requirements for environmental control as we work towards reducing our materials and energy consumption, and the amount of waste we produce.

The AIC Green Task Force (GTF) has surveyed the

AIC community to learn about recent changes and increased awareness of this problem within the field. We are investigating how AIC can implement green practices and encourage its members to follow suit. This paper presents protocols that will evolve as our environment and access to natural resources changes as well as communication tools for sharing these important ideas.

Specific energy-saving, waste-reducing practices include reducing courier trips through increased museum collaboration, careful consideration of treatment methodology and materials selection (including re-use), choosing the most benign solvents when necessary for treatment, reducing and reusing packing and display materials, and re-evaluating standards and protocols for environmental control to reduce energy consumption. Methods of working in a more sustainable fashion employed by similar industries and conservators abroad are also considered.

Our profession is by nature creative and conservative with materials practices and use of resources, which is a good start. As each individual or institution takes steps towards sustainable practices others are taught and encouraged to do the same. It is time to go beyond discussing "Going Green" and adapt our work to significantly and rapidly reduce our environmental impact.

## BEING MODERN: CONSERVATION AS REVITALIZATION OF CAIRO'S AL DARB AL AHMAR

*Frank Matero, University of Pennsylvania*

If there ever was a moment in time when the conservation profession had something to contribute to the current malaise of global economic recession, environmental destruction, and social strife, it is now. Conservation concerns itself with the protection of cultural heritage from loss and damage. For the general public and non-professional this is often viewed as the survival of the old and especially in hard times, an expendable luxury. It is a luxury because the assumption is that the only true progress, be it physical, economic, or cultural, must be based on that which is new. That which is existing or old is far from the new and not part of real progress or progressive solutions. This is, of course, untrue; conservation is both creative and progressive. In today's climate, it is in fact subversive in its interest in mending the flawed rather than in discarding and starting anew, in finding new life in the outdated.

Conservation is a creative act whose creativity derives from the impulse and ability to repair. To bring together the past and present by thinking and acting in ways different from the original processes that created the work and to forge a new identity that is sensitive to all contexts, both past and present are the conservator's goals. But as Elizabeth Spelman has aptly observed, the capacity of professionals to repair things can scarcely be valued in any society whose economy is based on the production of and the desire for the new. Repair is at odds with the imperative of a capitalist society.

Of course not everything that is broken can be repaired. But the concept of conservation begins first with considering the benefits of retaining all or part of the existing. It considers the functional, aesthetic, associative, and economic values embodied in the existing work and it possesses a remarkable set of technical knowledge and skills unique to it alone to discover, revive, and reuse. Its concerns and methods of analysis, intervention, and, especially, prevention are part of the definition of sustainability and it has much to offer all professionals and the public in the ascendancy of that concept. But like the definition of creativity itself, sustainability has been cast as a new concept with new ideas, and so conservation has had limited recognition or influence in its contributions to the current debate. Embodied energy, traditional passive environmental control, life cycle management (aka maintenance), high performance materials and systems, and social sustainability have all been a part of the preservation agenda in one form or another since the beginning of the movement.

Based on this premise, conservation as an alternative to the destructive forces often associated with “modernity” will be examined through the recently completed program for the conservation and rehabilitation of the Darb al Ahmar district of medieval Cairo. Concepts of sustainability will be explored and critiqued through the integrated conservation of the art, buildings, and social and cultural traditions of this World Heritage site as coordinated by the Aga Khan Trust for Culture.

### **CAPTURING THE MOMENT: CONSERVATION VALUES AND THE CHALLENGE OF TIME-BASED MEDIA**

*Glenn Wharton, Museum of Modern Art and  
New York University*

Time-based media presents dilemmas for an object-based profession. Kinetic, moving image, and performance works introduce time as an artistic medium to be conserved. Temporary installations include artifacts and ephemeral technologies that are altered for each iteration of the work. Conservators find themselves working in collaboration with artists, technicians, and other museum colleagues to install these installations while making decisions on the fly about their material manifestation. When artists assign rights to perform their works in perpetuity and allow migration of analog audio and video to new digital technologies, conservators strive to document their intentions for future generations of decision-makers.

All of this challenges our core principles of material authenticity and our professional ethics developed to preserve the conservation object. Just how do the values of our profession apply to conserving an ephemeral experience? This presentation draws from media and performance installations at the Museum of Modern Art to illustrate how traditional conservation theory guides policy and every day practice in conserving time-based media. Cross-disciplinary working

groups and new forms of documentation within the museum point to changes in traditional practice. More diffuse along professional borders, focus shifts to sustaining the artist's vision for temporal experience.

### **BLINK TWICE: MAKING MISTAKES IN CONSERVATION**

*Michele Marincola*

Beginning with several case studies that feature mistakes in technical analysis or treatment of works of art, this paper will present the fundamentals that lie behind how conservators sometimes make the wrong decision. Like several better-studied professions, such as emergency room medicine, conservation often involves decision-making under conditions of stress and uncertainty. Time, access to analytical equipment, or detailed and accurate knowledge about the artwork can be in short supply, increasing our sense of not being sure we are right. Ironically, more technical information, which is easier to amass with new user-friendly and non-invasive instrumentation, isn't necessarily the answer. As cognitive psychologists have shown, when people face uncertainty, they are susceptible to emotional reactions and personal bias, and become prone to mistakes in thinking. Another important stumbling block is encountered on the road to the right decision. The human propensity to use shortcuts in our cognitive process (known as heuristics) lets us make decisions efficiently and quickly, but not always accurately. This paper will explore some of the common biases and heuristics found in conservation, and draw comparisons with fields where these sources of error are well known, including medicine and financial investing. Lastly, some suggestions for how to avoid these common pitfalls in thinking, and so reduce the risk of mistakes, will be made.

# ARCHITECTURE

## NEW INSIGHTS INTO DOLOMITIC LIME MORTAR

*Jennifer Schork, Columbia University*

This paper reviews a comparative study of the physical and chemical properties of dolomitic and high calcium lime mortar with respect to their use for the construction and repair of buildings. This research is of interest to the building conservation field because dolomitic lime has been widely used as a binding material in masonry mortar for over 70 years without a basic understanding of its properties. Investigating the chemical curing process of dolomitic lime mortar, and how the chemistry affects the physical properties of the mortar, is yielding new information.

Physical properties were examined in hundreds of dolomitic and high calcium lime mortar samples. Tests include biaxial flexure strength, capillary uptake, rate of water vapor transmission, ultrasonic velocity, and resonant frequency. Chemical properties were explored through x-ray diffraction (XRD). This technique was used to determine both the hydration and carbonation rates of each type of lime, particularly focusing on the carbonation of the magnesium hydroxide within the dolomitic lime.

Historically, dolomitic lime was often preferred for its superior qualities of workability, yet it presented difficulties during the slaking process, as it required much more time to hydrate than high calcium lime. With the advent of a new machine for hydrating dolomitic lime in the 1940s, it could be easily hydrated, packaged, and sold. This product enjoyed great popularity during the second half of the 20th century, particularly as a binder in repointing mortars.

Dolomitic lime mortar behaves differently than mortar containing high calcium lime, yet too often no distinction is made between the two. The overwhelming majority of bagged 'Type S' dry hydrated lime currently used in North America is dolomitic. 'Type S' lime is commonly specified based on the ASTM C-270 designation, yet the ramifications of using dolomitic lime are rarely given full consideration.

## CONSERVATION OF BRONZE PLAQUES, TEXAS MEMORIAL STADIUM

*Danielle Boss, The University of Texas at Austin*

In 1924, the University of Texas at Austin built the first phase of as Darrell K. Royal Texas Memorial Stadium. In 1927, 223 memorial plaques were installed in the east and west stands. These cast bronze plaques measure 8 by 12 inches. Each plaque includes the individual's name, rank, and date and location at the time of their death under the words "In Memoriam" in raised lettering. Written correspondence from 1927 describes these plaques as "heavily lacquered to prevent tarnishing" and assures that "instead of deteriorating [the plaques] will become more beautiful with the passing of time." ("Royal-Memorial Stadium-UT" vertical file. Center for American History. The University of Texas at Austin).

The plaques are in varying states of deterioration. The plaques with the worst appearance have a failing clear coating over what appears to be an artificially applied, gold-colored patina. The deteriorated, clear coating is contributing to a highly irregular surface appearance. Solvent regulation has expanded in recent decades, including the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PEL), designed to protect workers against health effects of exposure to hazardous substances, and the regulation of hazardous air pollutants (HAP) and volatile organic compound content (VOCs) under the Clean Air Act.

This project will focus on the process of choosing and testing solvents to remove clear coatings from bronze, with the goal of finding an effective and less toxic alternative to solvents currently used for coating removal. The project will include testing to determine the alloy of bronze used in the plaques, and testing on the existing clear coating. A variety of solvents were tested to create customized solutions to remove clear coatings by using the Modular Cleaning Program, a database designed to assist with the design of cleaning systems.

## BIOLOGICAL GROWTH ON THE ALAMO

*Casey Gallagher, The University of Texas at Austin*

The limestone façade of the Alamo shows areas of biological growth with black streaks discoloring the stone. This presentation investigates the identity of these microorganisms using two methods: DNA identification, and lab cultures grown from samples of the biofilm. By using both approaches, a better understanding was gained of the range of organisms present. It was found that the dominant organism on the limestone is cyanobacteria, of the genus *Chroococcus*. Lab cultures revealed other organisms, including possibly fungi photobionts and algae.

Through comparison of historic and contemporary photographs, patterns of re-colonization were investigated. To further understand the effects of biocide treatments, cultured samples were treated and their reactions monitored. To understand the possible relationship between the Alamo stone and its colonizing organisms, physical properties of the stone were investigated through SEM images, EDAX and water absorption tests.

The cooperation of experts in geology and biology allowed for a better understanding of the components of the Alamo biofilm, and the methodology represents relatively new technology for architectural conservators. The combination of DNA identification and sample cultivation provides a valuable laboratory counterpart for comparison to *in situ* re-colonization. With more studies of this type, the DNA identification database can be populated with information pertinent to architectural conservation.

This study is the first of its kind to investigate Native Texas quarried architectural limestone. By using both DNA and lab culture identification, this study adds to a wealth of investigations of other conservation professionals. This study, like similar ones focused on Mayan temples, represents

a new cooperation between fields of science which, if continued, could produce a base of knowledge for organism identification that could lead to a better understanding of the components of biofilms, and more effective determinations on the necessity and type of treatments needed, resulting in a more sustainable conservation regimen.

## FATIGUE BEHAVIOR OF ADHESIVES FOR THE REPAIR OF MARBLE

*Laura Michela, Columbia University*

When considering adhesives for the repair of fractured marble the following factors *inter alia* come into play: strength, reversibility, creep behavior, and fatigue behavior. Thermosetting resins have been used for marble repair because of their strength, and, thermoplastic resins have been employed because of their reversibility. Strength and reversibility have often been thought to be mutually exclusive by many conservators.

In contrast, Koob has suggested that Paraloid B72 and other thermoplastic acrylic resins in the Paraloid family may possess the requisite strength for structural repairs. Recent work by Jorjani supports Koob's hypothesis by demonstrating that repairs done with thermoplastic adhesives have strengths similar to unfractured marble and marbles repaired with epoxy resins. Similarly, the creep behavior of these resins was explored by Buono, determining that little creep was noted for any system and that there was no discernible difference between classes of resins.

The present work explores the fatigue behavior of the same group of adhesives for marble repair. Fatigue is defined as progressive loss in performance that occurs when a material or assembly is subjected to low grade cyclic loading. Fatigue is a relevant factor for fractured marble repaired with adhesives because the repaired assembly may be subjected to vibrations.

In this work, freshly fractured marble cylinders are repaired with the following adhesives: Epo-Tek 301 B epoxy resin, AKE-POX 2000 epoxy resin, 40 w/v solutions of B72 in 1:1 v/v mixtures of acetone/ethanol, 40 w/v solutions of B48N in 1:1 v/v mixtures of acetone/ethanol, and 40 w/v solutions of a 3:1 w/w mixture B72:B48N in 1:1 v/v mixtures of acetone/ethanol. After curing, the repaired samples are subjected to low grade cyclic loading (approximately 50 N/ 1000 cycles) and then stressed in a four-point bend configuration until failure. These samples are compared to identical samples not subjected to cyclic loading.

## SOFT VEGETATIVE CAPPING OF ARCHAEOLOGICAL MASONRY WALLS

*Alex B. Lim, University of Pennsylvania*

Archaeological sites account for a large percentage of the world's cultural heritage and they rank among the most at risk from natural and human threats. The protection of exposed masonry walls and other architectural features depends ultimately on control of moisture, temperature fluctuations, and movement. Exposed compound walls traditionally have been protected by hard cappings of lime, cement, and modified soil mortars. However, hard capping has been found to be inadequate in addressing the long-term management of moisture ingress and thermal movement that will continue to stress and damage masonry walls. Instead of protecting the wall as initially designed, hard capping can actually accelerate deterioration over time. Moreover, such approaches to stabilization and display have been challenged by culturally affiliated groups (e.g., Native American tribes) as to their insensitivity to the environment. In order to counter such problems posed by hard capping, a procedure called 'soft capping' has been introduced in recent years at several archaeological sites in England, Turkey, and elsewhere. Soft capping replaces hard caps with vegetation planted on top of layers of soil, gravel, and geo-synthetics. The idea is to prevent water penetration and to reduce thermal fluctuations by taking advantage of plants' abilities to utilize the water and provide a protective barrier on the wall top. The concept is very similar to the green roof technology that has gained increased popularity in recent years. This paper will present laboratory- and field-based research conducted on the performance characteristics of soft capping for the exposed masonry walls at Mesa Verde National Park, Colorado. Wall movement, moisture, and temperature, as well as environmental conditions were monitored to evaluate the effects of hard and soft-capping on the test walls.

## THREE-DIMENSIONAL LASER SCANNING FOR IMAGING, QUANTIFYING, AND MONITORING MICRO STONE SURFACE DETERIORATION AT HERITAGE SITES

*Jessica Kottke, University of Pennsylvania*

This paper illustrates an application of *in situ* three-dimensional laser scanning utilizing the stone lion sculptures at the Merchant's Exchange Building in Independence National Historical Park, Philadelphia. The principal project goal was to investigate the practicability of using three-dimensional laser scanners as recordation tools in the conditions surveying process. Prior to conditions surveying, deteriorative conditions for Pennsylvania Blue Marble were identified and analyzed, including their visual indicators, intrinsic and extrinsic causative factors, and their structural effects. Three-dimensional models of the lions were generated from the scan data, conditions were mapped onto the models, and the

resulting images were used to evaluate, quantify, prioritize, and visually communicate deterioration pathologies. These 3D images can now be used for the development of treatments and monitoring programs.

A second component of the project investigated the ability of three-dimensional laser scanners to be used for monitoring stone surface deterioration at the micro scale. Two approaches were developed for evaluating monitoring methodologies. The first approach established the required point cloud resolution for potential monitoring schemes according to the maximum practical time interval between scanning sessions. The second approach established the minimum time interval required between scans according to the resolution limits of the scanning equipment. This revealed how point cloud resolution drastically affects the required time interval between scans. The information can be used to determine project feasibility, appropriate scanning hardware, monitoring timeframe, error margins, final data size, as well as required computers and software applications.

The test case investigating the use of laser scanners for conditions surveying was successful, resulting in integrated images illustrating the deteriorative conditions for each lion. However, the test case investigating micro-scale monitoring revealed many limitations related to the scanning process, especially when working with point cloud resolutions above 0.05mm or for stone recession rates lower than 0.035 mm/yr.

## EVALUATION OF HISTORIC MORTARS: IS PETROGRAPHY EVER ENOUGH?

*L. Brad Shotwell and Joshua D. Freedland,  
Wiss, Janney, Elstner Associates, Inc.*

Four case studies demonstrate that petrographic studies, although qualitative in nature, may provide sufficient information to allow for the selection of appropriate repair materials.

A concrete sample removed from the wall that surrounded the perimeter of property in the Windmill Hill area of Gravesend, England, owned by William Adspin, was examined petrographically. Free copper embedded in isotropic (slag) particles was detected and indicated that the concrete contained a portland/slag cement. Chemical studies conducted for ASTM C1324 would not have detected the copper. Since the concrete contained limestone aggregate, interference for calcium and silica would have occurred in chemical studies.

Examination of mortar from St. James Church in Chicago revealed the mortar was a sand/ lime system that contained some limestone aggregate. A micro-chemical qualitative chemical test indicated that the lime in the binder was dolomitic. Concurrent ASTM C1324 chemical studies confirmed and quantified these observations. The petrographic observations might have provided the conservator with sufficient information necessary to develop a repair mortar.

The acid-insoluble residue of mortar studies is typically

assumed to consist of the sand aggregate. Incomplete dissolution of matrix can skew gradation results. While examination of a thin section cannot yield a true sand gradation, comparison to mortars containing available sands with known gradations would allow selection of a closest match. In some cases this may be adequate.

Petrography may detect restoration errors made years ago. An examination of a 1908 stucco restoration that consisted of overcoating a weak lime system with “modern” portland cement is given.

## THE MORTARS AND CONCRETES OF FORT JEFFERSON: A CRITICAL EXAMINATION OF EFFECTIVE ANALYTICAL TECHNIQUES FOR UNIQUE CONSTRUCTION MATERIALS

*John J. Walsh, President/Senior Petrographer, and  
Magdalena Malaj, Highbridge Materials Consulting, Inc.*

A variety of mortar analysis techniques have been discussed in the literature over the last several decades ranging from simple bench-top methods to sophisticated instrumental techniques. Yet, all seek to distinguish and quantitatively separate the constituents for independent measurement. All admit that significant errors arise where these components are not readily separated.

Mortars and concretes used in the 19th century construction of Fort Jefferson in the Dry Tortugas, Florida are misleadingly simple in composition, consisting of a natural cement binder and local carbonate sand and coral fragments. However, the materials defy analysis based on systematic analytical treatment. The carbonate aggregate is more acid-soluble and carbon dioxide-rich than the binder rendering simple acid digestion or calcimeter methods useless. The low-firing of the natural cement results in acid-insoluble species and these “appear” as aggregate using acid-digestion techniques. Compounding measurement interferences related to the original components are those caused by the service history. One hundred-fifty years of seawater exposure have saturated the mortars and concretes with chloride and sulfate salts. Any chemical analysis of the material is skewed by these later additions.

These materials may be considered onerous but are not impossible to interpret if one employs a forensic rather than algorithmic approach to the analysis. A combination of petrographic and chemical techniques using various ASTM standard methods and justified modifications will always result in a more accurate interpretation of such “difficult” mortars. This case study represents several years of study on these deceptively simple mortars and concretes and examines how the espoused methods not only produce robust and meaningful results but also closely reproduce well-documented mix designs specified by General Joseph Totten for the original fort construction.

## THE APPLICATION OF OPUNTIA SP. MUCILAGE IN THE PRE-HISPANIC AGE, TODAY

*Nora Ariadna Pérez Castellanos, Chemical Engineer*

In recent years, restorers in Mexico have used extracts of plants such as orchids or seaweed, obtaining good results especially with the mucilage of the cactaceous *Opuntia sp.* with recent applications in the consolidation of adobe and lime made buildings.

The pre-Hispanic cultures of Mesoamerica used to mix their mortars and paintings with these extracts. It has been determined that the use of mucilage for the facture of pre-Hispanic wall paintings was a frequent practice. Restorers have noticed that the mucilage gives better properties to the mortar. To verify this knowledge, tests have been performed to relate the proportion of mucilage in the mortar of lime and different measured properties.

An experiment was designed to vary the proportions of the solids in the mortar and also the proportions of mucilage and water. In total, twelve experiments were performed measuring consistency, adhesion, contraction, carbonation process, viscosity, and load effort. The results obtained showed that the mucilage works by delaying the hardening time of the mortar, decreasing the percentage of contraction, increasing the fluidity of the mortar, and also suspending the solids for longer time in comparison to the mortars that only had water. The adhesion and the load effort were also increased by this additive. After the analysis, quadratic correlations were established for each property using the statistics software Statgraphics 5.1.

Based on these tests it was concluded that the mucilage of the *Opuntia ficus indica* improves the physical properties of the mortar making it a suitable additive on injection mortars for consolidation of cracks in lime based constructions, with a very low cost of only 0.77dolls per kilogram. These results show that in the quest for new materials, looking back and studying the ones used in the past can bring us to the materials of the future.

## PERFORMANCE ANALYSIS OF HYDRAULIC LIME GROUTS FOR MASONRY REPAIR

*Victoria Pingarron Alvarez, University of Pennsylvania*

A laboratory-based testing program was designed to assess and evaluate a low-weight, natural hydraulic lime grout. Three formulations were prepared which appraised particle size, material composition, flow, set time, shrinkage, capillary rise, water absorption, drying rate, water vapor transmission, splitting tensile strength, compressive strength, frost resistance, and salt crystallization resistance according to standardized testing procedures. Of the three formulas tested, a mixture composed of 2 parts natural hydraulic lime (NHL 3.5), 1 part fine sand, 1 part ceramic microspheres (by volume) mixed

with 10% acrylic emulsion (by volume, in water) was found to display optimal properties. The evaluation determined that this formulation exhibits the desired properties of high flow, low viscosity, low shrinkage, minimal segregation with high homogeneity, reasonable set time, adequate water absorption and vapor transmission, compatible splitting tensile and compressive strengths lower than the material to be grouted, and resistance to frost.

## REVISITING REALITY: A CHANGING APPROACH TO ENVIRONMENTAL CONTROL IN HISTORIC HOUSE MUSEUMS AT HISTORIC NEW ENGLAND

*John Childs, Conservator, and Benjamin Haavik, Team Leader/  
Property Care, Historic New England*

In 1993, responding to increased concerns about the care of its collections and buildings, Historic New England embarked on a multi-year project funded by the National Endowment for the Humanities to improve environmental conditions at eight properties. Recognizing that relative humidity presented the greatest challenge, Historic New England planned to identify and reduce moisture infiltration, and control RH through humidistatic heating and ventilation using direct digital controls. Historic New England has reviewed the performance of the NEH systems and assessed current conditions at the sites. Based on the review, Historic New England has modified its approach to environmental monitoring and control. A 2009 IMLS conservation project support grant is helping to fund the implementation of this new approach.

Collections care revealed condition problems that developed since the introduction of new systems at some of the NEH houses. A review of systems identified a number of problems. Digital control systems failed easily. Regular upgrades were not included in budgets. Reliance on digital control systems to provide monitoring data was unsuccessful. Ventilation of basements to control moisture was rarely successful. And finally, efforts to control costs during implementation led to installation of equipment that was incorrectly sized and balanced; of inferior quality; and under maintained.

Historic New England has instituted a program using data loggers, administered by a dedicated staff member. Historic New England has developed a new approach to environmental control: 1) Eliminate the use of Direct Digital Controls 2) Use passive structural systems where possible to keep moisture out 3) Control the moisture in basements separately 4) Allow a wider range of RH values 5) Allow spikes in RH.

Historic New England has implemented this new approach in several houses, and is evaluating its new systems.

## A REVIEW OF 100 YEARS OF SITE MANAGEMENT

*Avigail A. Charnov, Architectural Conservator, Historic Resources Group, and Jake Barrow, Program Director, Cornerstones Community Partnership*

The lecture will look at the over 100 years of site management, current practices, and what the future may hold for the conservation of earthen architecture, primarily in the American Southwest.

Earth has been used for construction since humans first began to build and earthen architecture is found on every continent. These buildings include some of humanity's most treasured historical and world heritage sites. Conservation of these sites poses challenging questions regarding conservation methods and historic preservation.

Site managers are faced with the challenge of balancing conservation and presentation. There is no ideal choice. It is impossible to prevent a ruin from continuing to deteriorate without changing its appearance, or its status as a ruin. Therefore the conservation of historic earthen ruins should perhaps be more appropriately thought of as extending the process of decay over time, rather than suspending or preventing it.

The mandate of the architectural conservator is to find a way of stabilizing the structure without replacing too much historic material. How do we reconcile this standard with the fact that, historically, the standard maintenance of historic earthen structures has involved the routine replacement of deteriorated fabric with new? Where do these practices fit in when faced with the conservation of a material where replacement of deteriorated fabric has been, historically, an accepted part of the regular maintenance of earthen structures? Further challenges are posed by the fact that abandoned historic adobe sites are often found in a state of such disrepair that less than 50% of each structure remains standing. Faced with these ethical issues, the conservators and organizations charged with the care of earthen heritage struggle with how best to conserve these monuments. Approaches range from protective coatings, capping and veneer application, drainage, wall braces and supports, wall foundations, vegetation, roofs, shelters, reburial, and reconstruction.

## PICKING, PEERING, AND PEELING: THE EVOLVING FIELD OF ARCHITECTURAL PAINT RESEARCH

*Mary Jablonski, Conservator, and Stephanie Hoagland, Conservator, Jablonski Building Conservation, Inc.*

Architectural paint research began with the process of picking and cratering painted surfaces. This practice proved unreliable and evolved into a more scientific study using the techniques and theories of painting conservation where tiny flecks of paint are examined under the microscope and

the original finish color, binder and pigments are identified. However, unlike most paintings, architectural interiors are covered with multiple layers of paint, and often have a decorative painting scheme hidden below modern plain walls. In addition, concealed below these multiple layers may be the evidence of removed items such as chair rails, wainscot paneling, or partition walls. Architectural paint research as a tool has evolved from merely identifying the original finish color to paint archeology. It can now tell us how an interior has evolved over time as styles and usages have changed.

Within the last few years, the microscopic examination of paint is no longer considered sufficient for the study of interior finishes. A group of international paint researchers has been meeting for conferences and their discussions have helped elevate the standards for architectural paint research. It is now becoming standard practice for paint researchers to use "reveals" to peel back the layers, one at a time, documenting each layer to understand how the building interiors have evolved over time.

Using the example of the Colonial Building in Newfoundland Canada, we will discuss the complexities of architectural paint research. The paper will examine the evolution of the techniques used on this project, the limits of the individual techniques, and how techniques need to be used in conjunction with each other to understand complex finishes. In addition to the microscopic examination and the paint reveals, extensive research was also undertaken on English decorative painting techniques of the 19th century.

## IN SEARCH OF DIANA & ENDYMION: THE RESEARCH AND RESTORATION OF LEAD SILHOUETTE WINDOWS

*Neal A. Vogel, Principal, Restoric LLC,  
and John Clark, Owner, Wardell Art Glass*

This presentation will cover the on-going saga to research and restore 334 lead silhouette (i.e. lead overlay) panels originally installed in 1928 by D'Ascenzo Studios, removed from the coach house of a Buffalo residence in 2002. Depicting nudes and bacchanalia scenes, the windows were defrocked circa 1950 by the Buffalo Diocese when the private residence was purchased for the Bishop's residence. The lead-overlay windows have presented many challenges including elusive missing artwork, technical challenges of removing and attaching lead-overlays on both faces, historic authenticity desired for the original steel windows and doors, and logistical complications of multiple contractors who have been involved over time. A historical overview of lead silhouette windows and D'Ascenzo's work set in context with Greene & Greene (Pasadena), Edgar Miller (Chicago), and G. Owen Bonawit (New York) will be included in the presentation as time allows.

## IDENTIFYING AND TREATING AGED WATER REPELLENTS ON HISTORIC STONE STRUCTURES

*Patty Miller, Senior Conservator/Project Manager, Justine Bello, Assistant Conservator/Project Manager, Mark Rabinowitz, Vice President/Senior Conservator, and Joseph Sembrat, President/Senior Conservator, Conservation Solutions, Inc.*

The treatment of historic stone structures requires understanding and addressing the consequences of previous interventions. Currently, this may include relatively recent treatments such as water repellents, consolidants, and other protective materials which are difficult to observe. These treatments can themselves be the cause of active deterioration and can influence the direction and available means of successfully conserving the structures. Unfortunately, the application of preservative materials such as waxes, oils, silicones, mineral conversions, and stone strengtheners on older stone buildings and monuments have frequently gone largely undocumented during their long outdoor exposure. For conservators working closely with scientists, confirming the presence and condition of an undocumented water repellent or other stone coating is merely the first challenge among many when developing a treatment plan. Determining the existence and nature of the coating, its reversibility, and the possible negative interaction it will have on prescribed repairs through observation and targeted testing is essential before a treatment can be selected. Using several recent case studies of historic limestone and marble structures, this paper will address preservative-related deterioration, in-site detection methods, traditional and novel laboratory detection methods, and treatment reversibility versus re-treatability.

## REMOVAL OF CLEAR COAT LACQUERS WITH LASERS

*Andrzej Dajanoswki, Director, Conservation of Sculpture and Objects Studio, Inc.*

The use of the laser ablation process for removal of deteriorated coatings will be discussed with a focus on Incralac removal. The treatment of the Tadeusz Kosciuszko by Kazimierz Chodzinski, which has been exposed outdoors in Chicago since its installation in 1904 will be discussed. Current *in situ* cleaning options in the conservation field—primarily poulticing, chemical stripping, or abrasion—present environmental problems, especially containment and disposal of chemical runoff or abrasives which can prove very difficult and expensive to resolve. Laser technology provides conservators with a cost-effective and safe tool for the controlled removal of failed coatings, avoiding environmental issues and their financial consequences.

## UNDERSTANDING PERFORMANCE PROPERTIES AND LIMITATIONS OF COATINGS FOR METALS

*Tami Lasseter Clare, Portland State University*

The conservation and preservation professions in the U.S. and Europe face the real prospect that in the near future there will be no viable clear coating systems to protect outdoor monuments, sculptures, buildings, and other significant artifacts made of copper or iron alloys against corrosion and degradation. If regulations outlawing the use of solvents common to the formulation and application of such coatings are expanded in the next two or three years, the only options available may be short-lived wax pastes that typically require reapplication every one to three years and contain some percentage of solvents that are also likely to be restricted. In this paper, novel, environmentally safe, and long-lasting clear coatings for metal will be discussed. Through the use of a variety of additives, the mechanical and chemical properties of coatings may be tuned to improve coatings' performance. Such additives include nanoparticle clays that can increase hardness, control gloss, reduce water penetration, as well as reduce UV light induced breakdown of the coating itself.

## EVALUATING EXTERIOR COATING PERFORMANCE ON METALS

*Andrew Lins, Philadelphia Museum of Art*

Following a brief review of the basic chemical and physical properties of resins and waxes commonly applied in conservation treatments for exterior metalwork, this paper will present a discussion of typical failure mechanisms. Included in the discussion will be surface preparation issues, film formation defects, water permeation, the influence of additives and of residual soluble corrosion species on coatings performance and adhesion, and various coatings erosion phenomena that affect longevity. A variety of tests employed to evaluate coatings *in situ* and in the lab will be described, together with recent work to improve the monitoring of 'cleaned' surfaces before coatings are applied, with the goal of maximizing the interval between coating applications.

## BOOK AND PAPER

### DECISION-MAKING AND TREATMENT: THE EPHRATA CLOISTER ABC BOOK OF AN EARLY AMERICAN FRAKTUR

*Joan Irving and Soyeon Choi, Paper Conservators, Winterthur*

The decision to apply new treatment methods and technologies is often a difficult one for conservators. The history of restoration, and later conservation, is littered with technologies adopted and later discarded as unsafe. In paper conservation, fungicides, oxidative bleaches, and alkalization treatments have been modified or called in to question, particularly with the growth of conservation science and its vast contributions to our knowledge of how materials chemically interact, age, and degrade. Today's paper conservator, having experienced or witnessed the shortcomings of previous treatment protocols, has an understandable hesitance to adopt new technologies even when they are supported by promising scientific research. All treatment has side effects and despite recent advances in artificial aging, deleterious side effects that may appear in the future are difficult to portend.

This paper will discuss the decision-making process and treatment of a unique and, among cognoscenti, iconic work of early American fraktur known as the Ephrata Cloister ABC Book. This work is neither convincingly a book nor a primer for learning the ABCs, but rather a mysterious object that has puzzled scholars for decades. The designs are composed almost entirely of iron gall ink, bringing in to debate the use of aqueous anti-oxidant treatments and the appropriateness of them on a unique work of art. Ultimately, decisions guiding treatment protocols for this object included ample input of the owner while drawing on key trends in the treatment of iron gall ink – though ultimately leaving the application of an antioxidant to a future generation to consider. The authors will offer lessons learned from treating 69 similar works of fraktur and a glimpse into an 18th century religious order that has left its mark in beautifully scripted letters whose meaning is still unknown today.

### 13 YEARS LATER: LOOKING BACK AT A BOUND-PAMPHLET CONSERVATION AND CATALOGING PROJECT

*Consuela (Chela) Metzger, Lecturer,  
School of Information, University of Texas at Austin*

Bound-pamphlets have often been later broken apart in library collections in the name of conservation, access, or the ability to sell duplicates. Between 1994 and 1996, I worked as grant funded project conservator on a collection of over 300 damaged bound pamphlet volumes. The grant specified treating the bound-pamphlets as books, and rejected the option of disbinding. This paper will assess the observed functionality of these treatments after twelve years, including information about the actual use each volume has received since treatment. Observed natural aging of long fiber

paper board-reattachments, traditional leather re-backs, and modified traditional leather re-backs will all be discussed. Beyond the technical treatment observations, the overall question of disbinding bound-pamphlet volumes will be assessed from a conservation, cataloging, and access viewpoint.

### A SURVEY OF LEATHER CONSERVATION PRACTICES

*Jennifer Hain Teper, Head of Conservation, University Library,  
University of Illinois at Urbana-Champaign, and Melissa Straw,  
Director of Library Preservation, Goucher College Library*

A survey of leather conservation practices was sent out to fellow conservators as well as allied professionals via various Listservs. The goal of this survey was to ascertain what types of treatments and repairs were currently being practiced on leather bindings in a variety of professional settings. The authors wish to present the results of this survey and analyze them to show the continuum of leather treatment within and without the conservation community, highlighting not only emerging trends and established treatments, but also when, why, and by whom more traditional treatments, such as leather dressing, are still being practiced.

The scope of the survey collected data in four areas. The first series of questions collected information on the survey respondents. The second collected data on different methods of repair for leather bound books and the different types of materials used for those repairs. The third set of questions collected information on materials used in treatments of original leather bindings, focusing on frequency of use of materials such as adhesives, dyes, surface consolidants, lubricants, and cosmetic surface treatments. The last set asked this same series of questions, but in regard to treatments on "new" leather used as a repair material.

The survey gathered detailed data from 57 respondents, many of whom are conservation professionals and support staff, but also with significant responses from library preservation staff, special collections professionals and staff, and book dealers. The results show that newer leather treatments are being integrated by conservation and its allied fields, but that traditional treatments such as the application of leather dressings and cleaning with saddle soap are also still used.

Further analysis of how these respondents received their training may show a direct correlation between educational experience and the types of treatments they undertake, as well as other trends.

## AFGHANISTAN DIGITAL LIBRARY: CONSERVATION CHALLENGES

*Laura McCann, Conservation Librarian, NYU Libraries;  
Georgia Southworth, Independent Conservator; Melitte Buchman,  
Digital Content Manager, NYU Libraries*

The Afghanistan Digital Library (ADL) is a collaborative cultural heritage project established to preserve the printed history of Afghanistan from the advent of Afghan book printing in 1871, through 1960. The project is led by the New York University (NYU) Division of Libraries and funded through the National Endowment for the Humanities and private foundations. The long-term preservation standards for digitization, metadata, imaging and storage were implemented to provide full and free access to the digital collection throughout the world. Private collectors and libraries throughout the world provided the texts for imaging.

Consultant conservators and the staff of NYU Division of Libraries Barbara Goldsmith Preservation and Conservation Department prepared the physical materials for digitization, working to ensure that all text and imagery were accessible. The majority of the volumes were stab sewn, rather than sewn through the existing folds. If the text was obscured by the sewing, or by the limited opening of the textblock, dis-binding was necessary. Volumes dis-bound prior to imaging were rebound after digitization.

The presentation will describe how conservation treatment decisions were directly influenced by the accessibility provided by the digital library. The talk will cover the various binding styles encountered and how the quality of the digitization effort allowed conservation the opportunity to return the volumes to their pre-scan structures, even though those structures often restricted content accessibility. The ADL project is an example of a complex global collaborative digitization effort that requires conservators to re-examine assumptions and rethink the role of accessibility in treatment.

## CALCIUM PHYTATE TREATMENT ON 19TH CENTURY IRON GALL INK DOCUMENTS: OVERALL SUMMARY OF RESEARCH RESULTS AND IMPLICATIONS ON TREATMENT DECISIONS

*S. Tse & S. Guild, Canadian Conservation Institute, Dept.  
Canadian Heritage, Ottawa; D. Goltz, Department of  
Chemistry, University of Winnipeg, Manitoba; V. Orlandini,  
National Park Service, Harpers Ferry, West Virginia;  
M. Trojan-Bedynski, Library and Archives Canada,  
Gatineau Preservation Centre, Gatineau*

The effectiveness of calcium phytate in protecting works on paper containing iron gall ink has consistently been demonstrated since its first introduction by Neevel in 1995. In July 2007, an optimal procedure was published by the Netherlands Institute for Cultural Heritage (ICN),

with details, among other topics, about the pros and cons of the treatment. Nonetheless there are still reservation and discussions about if and when this treatment should be used.

In 2002, nine original iron gall ink documents, typically found in Canadian Archives, were subjected to 18 separate aqueous treatments comparing the standard calcium phytate-calcium bicarbonate ( $\text{Ca-phy-Ca}(\text{HCO}_3)_2$ ) treatment to deacidification with  $\text{Ca}(\text{HCO}_3)_2$  and magnesium bicarbonate ( $\text{Mg}(\text{HCO}_3)_2$ ), paper simmering, and other modified phytate treatments. Five sets of these treated samples were further subjected to exposure to heat and humidity (80°C, 65%RH, 8 weeks), high intensity light (3.71Mlux-hr, 14-40W Vita-lite fluorescent tubes, no UV filter), and elevated humidity at room temperature (85%RH, 22°C, 22 weeks). Changes were evaluated against unaged or untreated controls. Methods of evaluation include hyperspectral imaging, colour measurement, pH, bathophenthroline test and microfade testing. Results from this study have previously been reported in part in different venues as they became available. This paper will present a summary and overview of all the results, including those from microfade testing, and will present the key conclusions from this study that will help conservators make decisions about when phytate is most beneficial.

## WHICH INK? WHICH PAPER? WHERE IS IT?

*Florencia Gear, Independent Conservator, Former Head of  
FADAM Paper Conservation Lab, Buenos Aires,  
Argentina (2005-2009)*

FADAM, the Argentine Museums Friends Associations Federation, has held a Paper Conservation Laboratory, since 1994. The Laboratory, created to provide a solution for the progressive deterioration of paper based collections in Argentina, was the first of its type in the country.

Deteriorated iron-gall inks are present in manuscripts and drawings, and, in some cases, in a crucial element: a signature on a Diploma, the artist's signature on a watercolour or gouache.

The need to solve these cases and the complex nature of inks led us to the decision to study iron-gall ink composition, its process of deterioration, and the current treatments proposed by conservators and researchers.

The case presented is a folder holding manuscripts by Dr. Juan Antonio Argerich, a remarkable professional in Argentine Medicine History. He played a crucial role during the Yellow Fever Epidemic (*Typhus amaril*). This epidemic caused thousands of deaths in Buenos Aires in 1870.

The work presented shows the decision making process regarding highly damaged documents with iron gall inks, according to the results obtained in paper and ink analysis.

The basis for this investigation was the information available from other colleagues and scientists who have been working on ink corrosion phenomena, and the information received during the course "The History and Treatment of Works in Iron Gall Ink," October 2008 in Sao Paulo, Brazil.

This training was given by Dr. Han Neevel, conservation scientist, and Birgit Reissland, conservator from the ICN in Amsterdam, and with lectures and assistance by Valeria Orlandini, conservator from the U.S. Library of Congress.

Our main goal is to analyze the situation focusing on identification of papers and inks to be found in our region, to compare results with others obtained abroad. We aim to complete this research showing a variety of possibilities for appropriate storage of documents, adapting inexpensive materials available in our region.

### ***ARCHIVES CONSERVATION DISCUSSION GROUP***

#### **WORKING IN AN UNSTABLE ECONOMY: EXPERIENCES AND INSIGHT ON THE CONSERVATION OF PAPER-BASED MATERIALS IN THE PRIVATE SECTOR**

*Co-chairs: Marieka Kaye, Dibner Conservator, Huntington Library and Laura O'Brien-Miller, Conservator, Lewis Walpole Library, Yale University*

This year, the co-chairs for the Archives Conservation Discussion Group invited participants from the private sector, including both individuals and regional centers, to share their experiences. Participants will discuss a wide range of issues, including operating a private business with limited resources, innovative ways to obtain and use tools and supplies, and specific treatments developed under budgetary constraints. The tips and experiences of colleagues working outside a museum or library environment prove to be useful for any conservator working in a tough economic climate. Following presentations, the audience will be encouraged to share additional experiences and a Q & A session will provide an opportunity to discuss thoughts and ideas related to this broad topic.

The session will include the following:

#### **Operating A Regional Center In The Private Sector During An Economic Downturn**

*Michael Lee, Director of Conservation, Etherington Conservation Services*

#### **Bound and Determined: Challenges In Private Practice**

*Susan Lunas, Chief Conservator, Many Moons Book Conservation*

#### **Conservator: Sell Thyself**

*Wendy Bennett, Fine Art Paper Conservation*

#### **Oil And Borax: Conservation of the Pennsylvania General Assembly Collection**

*Jim Hinz, Head of Book Section, Conservation Center for Art and Historic Artifacts*

### ***LIBRARY COLLECTIONS CONSERVATION DISCUSSION GROUP:***

#### **CONSERVATION IN THE 21ST CENTURY: REVISITING PAST PRACTICES AND THEIR EVOLUTION IN INSTITUTIONAL SETTINGS**

*Co-chairs: Werner Haun, Collections Conservator, New York Public Library and Jody Beenk, Conservator, Princeton University Library, Rare Books & Collections Conservation*

#### **THE USE OF PAPER AS AN ALTERNATIVE TO LEATHER IN BOOK RESTORATION IN UNIVERSITY LIBRARIES' PRESERVATION DEPARTMENTS**

*Ann Carroll Kearney, Collections Conservator, University at Albany*

Leather has been used in bookbindings for centuries. It does, however, pose problems for conservation work. In addition to the inherent acidic content of leather skins, traditional tanning methods impart acid. The result is a material with a short useful lifespan and one which poses a danger to any text material with which it comes into contact. 20th century production methods, while they have inhibited acid development, increased the cost of an already expensive material. Many libraries and archives cannot afford to use leather in their restoration efforts, and others consider it problematic enough to warrant using substitute materials.

Following the example of Don Etherington in his use of Moriki paper, a number of University Libraries' Preservation Departments have adopted the use of this and other Japanese papers as alternatives to leather in restoration procedures. I am developing a survey of these departments requesting information on their use of Japanese paper as an alternative to leather in restoration procedures. I am also asking about the types of Japanese paper being used, the reasoning behind paper selection, and the identification of ongoing issues with this usage. I am analyzing and evaluating the data and drawing conclusions based on these findings.

This study will fill an unmet need for documentation of the use of both leather and paper in university conservation labs. In addition, it will offer groundwork for expanding the alternatives for material and procedure selection in the restoration of leather volumes.

## SYNTHETIC LEATHER FOR BOOK REPAIR

*Grace Owen, Senior Conservator, The New York Public Library for the Performing Arts, and Sarah Reidell, Associate Conservator, The New York Public Library Goldsmith Conservation Lab*

A novel treatment system is being developed at The New York Public Library's conservation laboratories for the repair of leather book bindings. Techniques routinely used by conservators of leather artifacts have been modified to enable the book conservator to cast custom-colored synthetic leather, with grain, onto a variety of support materials. The system for fabricating the synthetic leather can be manipulated to produce repair materials with a range of physical characteristics. Castings made on paper or non woven supports can be used as mending tissues, while those on cloth can be used to create covering materials for books or new bindings. The conservator can choose the best method of application to attach the synthetic leather to the book being treated. These include heat or solvent reactivation, and the use of starch, acrylic or vinyl adhesives. The mends produced are less invasive, thin, and visually more compatible than traditional repairs with leather or toned Japanese papers. The synthetic leather technique is simple, uses readily available materials, does not require the use of a fume hood, and is inexpensive. It will require more testing but is a logical step forward from existing (and accepted) book conservation practices.

## DIGITIZATION-DRIVEN LARGE-SCALE TREATMENT PROJECTS: OLD VOLUMES WITH NEW NEEDS AND CONSIDERATIONS

*Fletcher Durant, Project Conservator,  
The New York Public Library*

The Chinese Rare Books Project was undertaken by the New York Public Library with generous support from the National Endowment for the Humanities in order to improve the long-term preservation of and provide increased access to fragile materials. The project includes cataloging, conservation treatment, and digitization of a selection of rare Chinese manuscripts and printed volumes from the NYPL's collections. This project offers a case-study for the large-scale, digitization-driven conservation projects of nontraditional materials that many research libraries will undertake as they seek to provide users with greater access to their unique holdings.

The NYPL's Chinese Rare Book Collection contains a significant number of rare and unique titles, including the personal library of the 19th century English Sinologist and translator, Dr. James Legge. As part of the project, six diverse titles, composed of 93 volumes, deemed to be the most historically important items in the collection were selected for conservation treatment and digitization. These

volumes include various traditional Chinese binding styles and materials that do not figure prominently in many Western research collections. The selected volumes also reflect a variety of prior intervention decisions. Evolving conceptions of the book as object over the Library's hundred year history have influenced prior treatment decisions, but working with the curator, it was deemed crucial that all volumes be returned to more historically appropriate structures as part of the treatment and to assist in the digitization work flow.

As conservators increasingly manage projects that confound normal workflows, they must balance curatorial requirements, digitization needs, and handling and capture issues in order to ensure sympathetic (and successful) treatments within a demanding timeline.

## SHRINKING RESOURCES? INVEST IN THE DECISION MAKING PROCESS!

*Eliza Gilligan, Conservator for University Library Collections,  
University of Virginia Library*

Shrinking budgets can squeeze a Preservation Department in a number of ways: fewer staff hours devoted to repair, smaller supply budgets, and increasing pressure to demonstrate the cost-effectiveness. When damaged books keep coming from the circulation desk presenting tough choices, what is a department to do? The UVA Library Preservation Department has invested in the preservation review process, focusing on the tough choices presented by brittle, heavily damaged, low-use, or more obscure books that come through the general collections care workflow. We developed a part-time staff liaison position to do the legwork on cost benefit and follow up with the subject selectors to make sure that decisions are made in a timely manner. Our investment has resulted in increased collaboration with other departments, raising awareness of the condition of the library collections, and an understanding that the preservation department is doing its very best to make cost-effective choices.

## STRATEGIC FUTURE OF PRINT COLLECTIONS IN RESEARCH LIBRARIES

*Gary Frost, Conservator, The University of Iowa Libraries*

Use of research library collections is shifting from physical circulation to digital reformatting and screen delivery. Does this suggest a continuing role of physical collections or does screen delivery inherently suggest print disposal? Print-on-demand technologies will be evaluated from a preservation perspective. The interdependence of physical and digital collections will be explored. Finally, the role and redirection of preservation staff will be discussed.

## IDENTIFICATION OF HISTORIC PIGMENTS BY DIRECT MICROSCOPICAL VISUAL ANALYSIS

*Gary J. Laughlin, Ph.D., Senior Research Microscopist,  
McCrone Research Institute*

Although it is believed that the eye can discriminate millions of colors, the perception of them is produced in the brain. Fortunately, for the scientific analysis of artists' materials, paint is a physical substance produced on Earth. Here, there are far fewer choices—namely a hundred common pigments or so—that can be grouped loosely by colors commonly found in nature and pleasing to the eye: blue, green, yellow, orange, and red, together with neutral colors like brown, black and white. Within each color group, there are usually only about a dozen or so common possibilities.

Each pigment has its own shape, size, color, refractive index, birefringence, etc., and, therefore, it is distinguishable from all others microscopically by direct viewing with the polarized light microscope (PLM). There is no video or digital imaging, chart recording, or computer printout that needs to be interpreted. Because the microscope enlarges each pigment up to the size we see everyday objects, it frequently leads to the identity and the exclusion of all others. Particles with the same or differing color and quality, or mixtures of pigments, are easily recognized. Results from the PLM produce a narrow range of likely choices requiring far less time and expense by comparison to other indirect, non-visual methods. The microscopist only needs to prepare the dispersion, properly learn the pigments, and look through the PLM first.

A flowchart and key based on the one originally developed by Dr. Walter C. McCrone, and used to teach classes frequently offered by the McCrone Research Institute for the identification of pigments, will be presented together with descriptions for successful positive identifications using the Polarized Light Microscope.

## NEW ANALYTICAL TREND IN TESTING PAPER CONSERVATION MATERIALS: UTILIZING MINIATURE SPECTROMETERS IN THE LAB

*Ted Stanley, Princeton University Library, Princeton, NJ*

Chemical analysis was the only readily available method for testing materials in the conservation lab when I began a conservation career in the late 1970s. Many conservators saw reference resources such as Browning's *Analysis of Paper* as the "Holy Bible" for conducting chemical tests for paper fibers, adhesives, resins, and coatings that are associated with paper-based objects. It is still an extremely useful resource for a paper conservator, but the destructive nature of chemical analysis is a drawback. The results aren't always conclusive either, and only a very limited amount of information can be derived from such a test. Polarized light microscopy is also available, but it's a destructive technique and the resulting

information is somewhat limited.

Technical analysis has come a long way since the 1970s. Progress in the 21st century has brought advances in spectrographic instrumentation, bringing conservation analysis into the realm of the practical. It has resulted in producing research-grade instrumentation that is small, compact, and relatively inexpensive, yet as sensitive in data gathering as the full-size bench top units. The pint-size instruments are also extremely simple to use. Spectroscopic analysis is non-destructive in many cases and sampling takes hardly any time at all to perform. It provides a comprehensive analysis of materials.

The paper conservation lab at Princeton University Library has acquired a number of spectroscopic instruments over the past several years that are small in size yet powerful and economical. This paper will review the practical capabilities of analytical equipment that is presently available and demonstrate their everyday use in the conservation lab. Spectroscopic techniques such as fiber optic Raman, FT-IR/ATR, FT-IR/DR, and fiber optic UV/VIS for analyzing various paper-based objects will be covered.

## A NEW METHODOLOGY FOR WET CONSERVATION TREATMENTS OF GRAPHIC ART ON PAPER WITH A RIGID POLYSACCHARIDE GEL OF GELLAN GUM

*Silvia Sotgiu and Simonetta Iannuccelli, Paper Conservators,  
Laboratorio di restauro del patrimonio librario,  
ICPAL (Istituto centrale per il restauro e la conservazione  
del patrimonio archivistico e librario)*

Techniques used for wet treatments of graphic arts on paper must be carefully selected limiting any interference or modification of the original characteristics of the item. Unlike other works of art, wet treatments of work of art on paper always involve the entire structure of the document and cannot be limited to a "superficial layer" for the deep interconnection existing between paper fibers and graphic media. The use of a watery, rigid gel instead of traditional techniques (cellulose ethers or polyacrylic acid) has been conceived to try out a new method, more respectful of paper codicological and aesthetical evidence in this context. Since 2003 the Conservation Department of ICPAL has been testing and using a rigid watery gel of Gellan Gum, a microbial exopolysaccharide composed of tetracyclic repeating unit of one rhamnose, one glucuronic acid, and two glucose units. The rigid gel obtained with Gellan Gum is a uniform, constant, and controlled water release system for paper. The technique is very effective and can sometimes be used instead of a washing procedure. Recently, Gellan Gum gel has been used as a constant humidification system and working support during the separation of old paper repairs or linen linings from the "verso" of the items to be restored. Furthermore, it produced very good results as a carrier for enzymes, helping the removal of adhesive layers. This work

shows the application of the technique focusing on the results obtained both on original works of art on paper (in terms of opacity, brightness and pH value measures) and on Whatman paper samples in order to understand the different water absorption level of the same paper treated by immersion or by gel contact.

## **ROCK POSTERS FROM THE SUMMER OF LOVE: HAIGHT-ASHBURY AND THE ART OF PHOTO-OFFSET LITHOGRAPHY**

*Victoria Binder, Assistant Paper Conservator, Fine Arts Museum of San Francisco, Legion of Honor*

Offset lithography has been the dominant method of commercial printing since the mid-20th century. This workhorse of printing, with its complicated equipment and production sequence, left very little room for artistic experimentation. It was during the nineteen sixties, in the small, photo-offset lithographic shops of Haight-Ashbury San Francisco that commercial need and artistic vision came together in the creation of psychedelic rock posters.

The posters were created to promote music and dance venues at the famed Avalon Ballroom and Fillmore Auditorium featuring bands like Jefferson Airplane and the Grateful Dead. Working under tight deadlines, the artists broke every rule of conventional design, producing works that reflected the visual chaos and revolutionary spirit of the scene. Using sheet-fed, offset presses, the small, offset lithographic shops affordably produced large runs of the multi-colored posters in a short period of time. However, unlike larger commercial shops, they were able to provide an environment that was conducive to artistic input.

Within the context of the Haight-Ashbury rock posters, equipment, materials, and the major steps of the production sequence will be discussed. A review of the process will be supported with artist and printer interviews and technical literature from the time period. Original printing artifacts used for the creation of the Haight-Ashbury rock posters including drawings, films, and plates will be shown.

The presentation will conclude with an exploration of the printing inks and their light stability. One of the defining aspects of the Haight-Ashbury rock posters is the interaction of strong colors to achieve visual intensity and vibrational effects. Fading of the inks or shifts in hues could seriously compromise these dynamics. Research on the inks involved identification using scientific analysis and product research. Fading behavior was documented using accelerated light-fading tests conducted with a microfader.

## **READING BETWEEN THE LINES: WOULD YOU KNOW INVISIBLE INK IF YOU SAW IT?**

*Barbara Rhodes, Conservator, Department of Library Services,  
American Museum of Natural History*

Many people dismiss sympathetic inks, more popularly known as invisible inks, as a novelty or amusement, of interest only to spies and schoolchildren. In reality, their use may have been much more widespread, and even today they are a part of popular culture, as witness the phrase “reading between the lines,” which refers to the practice of writing invisible ink messages in between the lines of innocent-looking correspondence written in ordinary ink. Recipes for making these inks have been available in published sources since the 15th century, and some are even now finding new audiences through the internet. Formulas for sympathetic inks have appeared in chemistry textbooks for centuries to illustrate chemical reactions to students, and this use still continues in science classes.

Chemically, many sympathetic inks are related to the materials of early photography, document copying, and dyeing, and also to the so-called security or safety inks and papers used to prevent forgery and counterfeiting. In recent decades, especially as fluorescent and infrared-readable inks have been introduced, there has been a resurgence of interest in sympathetic inks, as a security measure for printing business and official documents, as well as for marking property.

This paper will present a brief history of the most commonly used sympathetic inks, their treatment in scientific and more general literature, and their connection to various branches of arts and sciences, plus some of the modern developments. The experimental section will include examples of writing done with the most commonly cited formulas as a visual reference; it will also demonstrate how to detect developed and undeveloped sympathetic inks on paper through modern non-destructive forensic methods.

## **MOLD OUTBREAK AT THE DOCUMENTATION AND INFORMATION CENTER LOCATED IN THE HOUSE OF REPRESENTATIVES, BRAZIL**

*Jucara Quinteros Farias, Chief of Conservation and  
Restoration, Brazil House of Representatives*

The Documentation and Information Center located in Brazilian Chamber of Deputies is responsible for making available and accessible the legislative information of Brazil and it is also in charge of the preservation institutional memory and cultural materials. The Center houses approximately 250,000 library books, one million manuscript documents dated between 1823 and 1946, 4,000 rare books dated from the sixteenth century, and around 700 art objects, including furniture and paintings.

The majority of the manuscript documents present a high

level of acidity deterioration and iron gall ink corrosion. In 2006, a mould outbreak was detected that affected around 30% of the manuscripts along with other collections of the library. Actions were taken immediately aiming to avoid a major disaster, and a project for the conservation treatment of these collections is under development.

In 2008, the conservation center started a project for the development of the Chamber of Deputies' preservation policy that should be implemented until 2012. The objective of this policy is to ensure the long-term of the collections by setting out the institutional preservation responsibilities and providing guidance to staff and users.

Preventive conservation is a relatively new field in this institution and during the last decade the majority of the work involved more traditional conservation treatments. Nowadays, the work is cared for collectively rather than individually. The conservators are focusing on ways of preventing or slowing the deterioration of the objects by improving environmental conditions, cleaning, handling, storage areas, and preservation awareness. During the last couple of years, we have learned that all actions and procedures related to the conservation field needs a significant elaboration before being implemented. By planning and assessing risks we will avoid error of conduct and allocate better the personal and financial resources.

### **A DIONYSIAN DILEMMA: THE CONSERVATION AND DISPLAY OF OVERSIZED POMPEIAN WATERCOLORS AT THE KELSEY MUSEUM OF ARCHAEOLOGY**

*Claudia Chemello and Suzanne Davis, Kelsey Museum  
of Archaeology, and Jamye Jamison and Wendy Partridge,  
Intermuseum Conservation Association*

Long-term display of works of art on paper is problematic, and installation of oversize works of art can be challenging, but a joint project between the Kelsey Museum of Archaeology and the Intermuseum Conservation Association successfully achieved both. This paper describes the treatment of 21 oversize watercolors and their subsequent installation in a setting that can function as both display venue and long-term storage. Painted on-site in the mid 1920s shortly after the Villa was excavated, the watercolors depict the fresco cycle at the Villa of the Mysteries in Pompeii. The watercolors, the largest of which measures twenty feet long, presented challenges not only because of their extraordinary size, but also because of their hybrid nature; they are painted on paper which is backed with canvas.

A previous installation had used an inadequate hinging system to mount the watercolors to rigid panels, causing ripples along the edges. Because of their large size, many of the works were stored rolled, and were thus inaccessible to students and visitors. The treatment involved gentle cleaning, humidification, flattening, and hinging of the watercolors

to aluminum honeycomb panels. Although much of the treatment drew on techniques commonly used in paper conservation, the watercolors were hinged to the aluminum panels using BEVA film, a technique often used in paintings conservation. Results from micro-fading tests of the watercolor pigments were used to design display lighting, and a simple cleat system was used to hang the panels.

### **THINK OVERSIZE! THE CHALLENGE OF MOUNTING, INSTALLING, AND STORING VERY LARGE CONTEMPORARY WORKS OF ART ON PAPER DURING TIMES OF CONSTRAINT**

*Joan Weir, Conservator, Works on Paper, Art Gallery of Ontario*

With the opening of newly built contemporary galleries at the Art Gallery of Ontario, the opportunity to showcase some unusually large contemporary artworks was enthusiastically embraced. A variety of oversize works on paper were requested for the inaugural exhibition and the success of these installations has opened the door for further requests on an ongoing basis.

Tasks associated with the examination, documentation, mounting, installation and storage of these artworks ranged in complexity and required interdepartmental participation during a very busy pre-opening period and later with reduced staff after opening. Innovative systems were developed and implemented along with use of typical conservation methods and materials. Decisions were affected by financial, time, and space constraints.

This presentation and paper will follow the process of examination to installation and storage of a number of contemporary works ranging in size and varying in materials. The largest works are an unframed collage on Mylar 25 feet by 11 feet and a temporary mounted/framed hand coloured aquatint, in six sections 2.5 feet x 17 feet long.

The suitability and success of the materials, techniques, and systems used are reviewed and discussed. Extensive photographic documentation and diagrams are provided for both the presentation and publication.

### **CONSERVATION OF A SERIES OF MURAL CARTOONS: HIGH HOPES ON A LOW BUDGET**

*Claire Titus, Conservator, New Brunswick Museum*

This paper outlines the challenges faced by a regional Canadian museum to undertake the conservation of a significant set of works in its collection.

Resources for museum projects that exceed the limits of the budget and exhibition schedule are never easy to find. Such is the case for the conservation treatment of the New Brunswick Museum (NBM) Saint John Tuberculosis Hospital mural cartoons (1941-42) by Saint John New Brunswick

artist Miller Gore Brittain (1912-1968). Miller Brittain is amongst Canada's most important twentieth century artists; the cartoons are the crowning achievement of his pre-war career.

Depicting the causes, effects, treatment, and cure of tuberculosis, Brittain's compositions are developed to varying degrees using layers of fabricated chalk and fixative. Each of the eleven cartoons measures approximately nine feet square and is made up of three nine-foot lengths of Kraft paper, joined with gummed brown-paper tape. Where the tape has failed or the paper is torn, the drawings have been previously and extensively "repaired" with masking tape. These are not uncommon condition problems in the field of paper conservation. However, the scale of a conservation project to address this damage is daunting. Not until 2006, when the cartoons were examined and their condition was assessed for the first time in over twenty years, was a treatment plan possible.

After a brief introduction to the NBM and to Miller Brittain and his work, this paper will describe the multi-phase conservation treatment plan for the cartoons. The first phase, the development of a treatment protocol, was completed in 2009 in the context of the Canadian Conservation Institute (CCI) Visiting Professionals program. The author will describe the research and development of the treatment protocol as well as plans for future phases of the project.

### JOINT SESSION: BPG & RATS

#### NON-DESTRUCTIVE ANALYSIS OF 14TH - 19TH CENTURY PAPERS

*Tim Barrett, University of Iowa Center for the Book; Mark Ormsby, National Archives and Records Administration; Robert Shannon, Bruker Elemental; Michael Schilling, Getty Conservation Institute; Joy Mazurek, Getty Conservation Institute; Jennifer Wade, Library of Congress, Preservation Research and Testing; Irene Brückle, State Academy of Art and Design, Stuttgart, Germany; Joseph Lang, University of Iowa; Jessica White, University of Iowa Center for the Book*

The William Barrow Laboratory's pioneering 1974 analysis of 1,470 historical papers from the 16th through 20th centuries demonstrated that early, well-preserved papers were made from pure cellulose (rags), were neutral or slightly alkaline in pH, and contained an alkaline reserve (likely calcium carbonate). Because the Barrow work was based on destructive tests, exceptionally stable 15th century papers were not included in the study due to their rarity and value.

With funding from the IMLS, the University of Iowa, and the Kress Foundation, and with support from a number of collaborating institutions, in the Fall of 2009 we completed a two-year study of 1,580 primarily European papers using non-destructive methods. Book, manuscript, and printmaking papers made between the 14th and the 19th centuries were tested using XRF and UV-Vis-NIR instrumentation. For each specimen, we gathered data on 15 chemical or physical

variables as well as publication information (date, title, author, country, etc.). The data show that the 15th century papers tested were thicker and had higher gelatin and calcium concentrations compared with papers made in subsequent centuries. Preliminary results also indicate that lighter color was generally associated with higher levels of gelatin and calcium, and overall superior materials and workmanship.

In two related experiments, we are investigating the ability of non-destructive XRF, UV-Vis-NIR, and ultrasonic methods to predict changes in the concentrations of Ca, Fe, alum, and strength in historical papers as a result of typical aqueous conservation treatments.

All research methods and results of the study will be published as an interactive website in 2010. Research results are expected to be of interest to conservators, paper historians, and those who manufacture modern archival papers. The data will also serve as a key reference for any future accelerated aging studies designed to investigate the causes of paper aging.

#### THE ROLE OF ELECTROPHILIC METAL IONS ALUMINUM(III) AND MAGNESIUM(II) IN PAPER DEGRADATION AND DEACIDIFICATION

*John W. Baty, Andrew W. Mellon Postdoctoral Fellow, William Minter, Senior Project Conservator, and Sa Yong Lee, Andrew W. Mellon Postdoctoral Fellow, Department of Conservation and Preservation, Sheridan Libraries, Johns Hopkins University*

While the oxidative degradation of cellulose in paper has been readily acknowledged to be complex, with different pathways favored over others depending on the oxidizing agent and the presence of light and catalysts, discussion of cellulose *hydrolysis* in paper, by contrast, has been virtually confined to a single proton-catalyzed mechanism. This is true despite a diversity of glycoside hydrolysis pathways presented in the physicochemical literature. Recent studies using a small carbohydrate to model cellulose suggested that the aluminum(III) ion, which is introduced to paper in alum-rosin sizing and for many other reasons, can attack the cellulose chain directly as an electrophile rather than just as a source of protons for Brønsted-acid catalyzed hydrolysis. These studies further suggested that an electrophilic path may in fact overwhelm the proton-catalyzed path under certain conditions relevant to heritage collections.

Heritage Science for Conservation, a part of the Department of Conservation and Preservation at the Sheridan Libraries of Johns Hopkins University, is drawing on those previous studies and greatly expanding them using actual paper as a substrate, thereby incorporating the periodic crystalline and amorphous regions of cellulose that are retained in paper, as well as the particular way in which water is adsorbed onto paper fibers. This research is measuring the electrophile catalyzed mechanism at an expanded pH range and is looking at the interactions of Al(III) with another electrophilic ion, Mg(II), to clarify the effectiveness of certain

deacidification methods to combat this electrophile-catalyzed mechanism of hydrolysis.

Targeting a core paper degradation pathway—the hydrolysis of cellulose—this research aims to deliver high-leverage data to three vital applications: (1) Conservation materials and practice (including deacidification), (2) specifications for modern permanent and durable papers, and (3) the efficacy of accelerated aging procedures to predict the permanence of paper specimens.

## ELECTRONIC MEDIA

### ENCOUNTERS WITH A VERY LARGE PICTURE COLLECTION: THE JOSEPH SELLE COLLECTION OF STREET VENDOR PHOTOGRAPHY

*Chris Burnett, Associate Professor, the University of Toledo*

My presentation chronicles ongoing creative ventures in working with the more than one million street vendor photographs in the Joseph Selle collection of the Visual Studies Workshop, Rochester, NY. Following a brief introduction of the collection, the digitization project, and “Selle Circle” collaborators, the talk will focus on the philosophical possibilities/challenges of very large picture collections, their distinct potentials apart from “normal” picture collections. I will use visual samples from projects done so far as well as describe opportunities for future projects:

- 1) Digitization and archival organization.  
Because of its sheer volume and physicality, the collection was unapproachable in the pre-digital era. It consists of 970, 100-ft. rolls of black and white negatives, each containing about 1500 images. Two pilot digitization projects have already been undertaken, with the intention to digitize the entire collection by June 2011.
- 2) Historical research and cultural studies.  
The collection was donated in 1977 by Joseph Selle who owned a street vendor photography business, whose photographers were active in San Francisco from the 1930s–1970s, selling souvenirs. The Selle collection is unique in that it is the only known collection of this size with images so densely similar and unvaried. The collection provides tremendous potential for future historical and visual culture studies.
- 3) Creative projects and art works.  
We have completed several projects that were based on the files rendered by the first digitization project including: an exhibition; an award-winning video; two artist’s books; and a critical essay.

Our current ambition is to create a gigantic mural for the streets of San Francisco, showcasing all the images in an extensive grid connecting the frames. In so doing, our project would open a frontier of undiscovered possibilities concerning the digitization, organization, research, and creative work with “very large picture collections.”

### IMAGE STORAGE AND PERMANENCE CONSIDERATIONS IN THE LONG-TERM PRESERVATION OF PHOTOGRAPHIC IMAGES—AN UPDATE AND ADDITIONAL CONSIDERATIONS

*Joseph Labarca, Technical Director Image Permanence, Eastman Kodak Company*

Archivists and consumers, alike, need to become aware of long-term storage and preservation issues that relate to the preservation of the data behind digital photographic images. The more obvious issues, such as accidental or catastrophic data loss and hardware format evolution, are only now being recognized in the archiving community. Consumers need to be alerted to these issues and be prepared to develop preservation strategies as well. However, longer-term issues beyond routine backup and migration of data need to be considered. The very basic solution of preservation via hardcopy images stored in shoeboxes or albums is one option, but this raises a fundamental question regarding image preservation that transcends even the more complex solutions—the long-term stability of the chosen media, whether digital or analog. This paper discusses archiving and preservation as it relates to images, and the data behind those images, along with historical perspectives and an overview of possible longer-term preservation strategies. The importance of image permanence standards, as they relate to overall selection of preservation strategies, will also be discussed.

### “PART OF THE ARTWORK” OR “ACCESSORY”? DETERMINING THE STATUS AND THE REPLACEABILITY OF TECHNICAL EQUIPMENT IN ELECTRONIC ART

*Joanna Philips, Associate Conservator of Contemporary Art, Guggenheim Museum NY*

Upon entering a collection, electronic artworks such as video, film, slide, and sound installations as well as computer-based art, light art, or kinetic works often include specific equipment chosen or approved by the artist due to its technical, functional, or aesthetic properties. This dedicated equipment is added to the artwork’s component list as “Part of the Artwork” and is stored and cared for appropriately.

But even before the individual life-span of such is exhausted, the technology itself can become obsolete, making it difficult for collections to maintain the artist-approved, ‘original’ devices. Their replacement with contemporary technology starts to become an imperative, if the exhibition and thereby the existence of the concerned artworks is to be continued. Nevertheless, neither the employed technology, nor the individual devices are variable per se—even if they are mass-produced objects—and their replacement is subject to controversy.

This paper argues that the replaceability of equipment is not only dependent on the artist's intent, but also on the historic dimension and context of the artwork, as well as its (changing) perception by the present-day audience. To protect the integrity and authenticity of such artworks, conservation professionals need to expand their responsibilities and be involved in the decision-making processes along with curators and technicians. To determine the replaceability of equipment, its status within the artwork has to be evaluated for its appearance, functionality, viewer perception, connotations, and impact on the integrity of the work.

These aspects are illustrated with examples from the Guggenheim collection, including works by Nam June Paik, Marina Abramovic, Robert Smithson, and Stan Douglas. Based on these case studies, a classification system is offered for discussion that may serve as a model for determining the replaceability of technologies and devices in electronic art.

### **“404 ERROR: FILE NOT FOUND”**

*Walter Forsberg, NYU Moving Image Archiving and Preservation*

We have all heard some version of the story where a hard drive sits, oddly juxtaposed, next to a priceless painting in the conservation lab. But how exactly does one initiate the conservation and preservation of new media (digital, hypertext, hacked objects) moving image materials and artworks in preparation for museum acquisition? What will artists' digital notebooks look like in the future, particularly if the artist is not around to explain file naming and hierarchies, or even hint at relationships between files? Using examples from a collection assessment of artist Cory Arcangel's early optical storage media, videotape, and hard drives, this presentation provides one approach being taken to ensure the intelligible longevity of non-traditional media.

### **DEVELOPING A DIGITAL ARCHAEOLOGY FOR THE WARREN SPECTOR COLLECTION: A CASE STUDY**

*Elizabeth Seramur, Candidate MSIS and CAS in Preservation Administration, University of Texas at Austin*

Accessing, retrieving, and preserving files stored on an array of early-to-mid-1980s 5.25-in floppy disks from the Walter Spector Collection presented a complex task of digital archaeology with the promise of rewarding solutions. The disks turned out to have been produced using a panacea of early personal computing machines, including Kaypro, Apple II, and IBM, and a variety of operating systems each more obsolete than the last. Along the way, we encountered several hurdles including:

- Lack of appropriate machinery/hardware
- Lack of necessary software
- Lack of industrial standardization in the early machines

- Lack of firsthand knowledge of obsolete computing procedures
- Lack of preservation protocol

Although each archival situation is unique in its own way, we were able to find creative solutions, developing preservation protocols and an archeological process that could prove useful to other collections interested in providing more meaningful access to obsolete media, while preserving the original bitstreams in perpetuity using DSpace.

It is a cliché to belabor the storied “fear of technology” on the parts of archivists and conservators. I think shifting the discussion somewhat away from excessively technical into the territory of archeological investigation would be very welcome and helpful. The importance of digital archeology is impossible to underestimate when dealing with technology of any vintage. Moreover, successful digital preservation efforts depend upon archivists adopting a collaborative stance with respect to creators, computer specialists, professional and nonprofessional (aka computer hobbyists) alike, and others as appropriate. In the course of our project, we had to be very resourceful, and in the end found some unexpected but useful collaborations with other organizations. I intend to frame the discussion as a case study with problems and solutions specific to it, but also make helpful broad suggestions of possible strategies for other situations.

### **STICKY SHED SYNDROME IN AUDIO MAGNETIC TAPES: POSSIBLE CAUSES AND ANALYSIS**

*Stephen C. Hobaica, Laboratory Manager, Library of Congress, Preservation Research and Testing Division*

“Sticky shed syndrome” is a condition caused by degradation of audio magnetic tape that results in the deposition of a gummy residue on the tape heads and guides during playback. It causes severe contamination of tape decks, which need to be cleaned before the tape can be played further. Therefore, tapes with sticky shed should be treated before playing to avoid possible damage to the tape. The Library of Congress is conducting research into the causes of sticky shed and developing nondestructive test methods for identifying which tapes have sticky shed. This presentation will discuss the composition of audio magnetic tapes, changes in molecular weight and water content for tapes with sticky shed and degradation reactions related to sticky shed. In addition, a non-destructive test method involving FTIR is discussed. FTIR results from tapes with sticky shed are compared to results without sticky shed (after treatment by baking) and differences in the spectra are discussed.

## BAKING, MINERAL OIL, AND WINDEX: MYTHS, HOME BREWS, AND A WEE BIT OF HARD SCIENCE—A LOOK AT THE STATE OF PRE-DIGITIZATION CONSERVATION TREATMENT FOR AUDIOVISUAL MEDIA

*George Blood, Principal, Safe Sound Archive*

Playing old sound recordings is part art and part science. Pre-playback conservation treatment, however, is almost entirely “art.” Very little scientific research has been published in peer review journals on the actions practitioners apply to playing old (and not so old) electronic media.

Among the topics to be explored:

- Why do we bake sticky magnetic tapes? “Because everyone says that’s what we should do.” In a 1982 article in the IEEE Journal the problem now known as Sticky Shed Syndrome was shown to be an issue of humidity, not temperature. In 2006, NEH funded a study at the Image Permanence Institute that concluded the chemistry of magnetic tape was too complex and varied too much from brand to brand (from product to product, from batch to batch!) to have any simple formula; and there was no linear correlation between baking and improved playback parameters.
- At a recent professional conference a paper was presented claiming to break new ground in the area of Sticky Shed Syndrome. A member of the audience asked if the research had been submitted for peer review. “Anyone qualified to review the data was a co-author.” Though the paper has been rejected by peer review journal, it is nonetheless being quoted.
- Lacquer (aka acetate) instantaneous recording discs leach their plasticizer and become coating in palmitic acid. It is nearly impervious to soap and water. One specialist uses mineral oil to dissolve the palmitic acid deposit then dishwashing liquid to clean off the mineral oil. Library of Congress published a cleaning solution that made short work of the palmitic acid deposits. It also ate through the plastic tubing of their cleaning machines.
- Many audio engineers play 78rpms discs with a bead of water under the playback cartridge. Why does this “sound better”? Do we give up accuracy of performance for a more pleasant sound? We don’t know.
- One engineer prepares 78rpms shellac discs with a light coating of Windex. The theory is there is a substance in elixir that “replaces an atom which is lost from the disc surface over time.”

This paper will look at the sad lack of hard science in the conservation of sound recordings.

## AUDIOVISUAL SELF-ASSESSMENT PROGRAM (AVSAP)

*Jimi Jones, Project Conservator, Audiovisual Self-Assessment Program, UIUC Library Conservation Unit*

The University of Illinois Library, with funding from the Institute of Museum and Library Services, is building an assessment tool for audiovisual materials (film, video, and audio) called the Audiovisual Self-Assessment Program, or AvSAP. AvSAP will assist cultural heritage institutions with audiovisual materials in their collections and staff who have little to no training in audiovisual preservation. Our goal is to help collections managers develop a prioritized preservation plan. With this session we would like to describe the genesis of the project, how we went about designing and testing the tool, and how the tool works from the user’s perspective. The program gives tips (many of which are low- to no-cost) about audiovisual preservation throughout the program and is both an assessment tool and an educational tool. This session will not just describe the workings of the tool but will also discuss the evolution of the project itself, including the technologies used to collate research and design and test the tool. The attendees will not only learn how to use AvSAP but also how a three-year project of this magnitude was managed. More information about the AvSAP project, its partners and its timeline can be found at [www.library.uiuc.edu/prescons/services/av\\_self\\_assesment\\_program.html](http://www.library.uiuc.edu/prescons/services/av_self_assesment_program.html).

## OBJECTS

### “INSIDE OUT, RED,” THE CONSERVATION OF AN ANISH KAPOOR POWDER-PIGMENT SCULPTURE

*Andrew Smith, Assistant Conservator,  
Sculpture Conservation Studio*

Raw pigment is the building block of color, whether used in the cave paintings of Lascaux or the spray-paint graffiti found on a city wall. Regardless of the medium, raw pigment enables color to communicate. But what happens to the strength of this communication when raw pigment becomes the sculpture itself and is threatened by human and environmental factors? The conservation of Anish Kapoor's *In Search of the Mountain* presented a challenge and required the development of a specific approach to dry pigment application as a primary sculptural surface coating.

The works of Kapoor often induce perceptual disorientation in both large and small scale. Viewing a Kapoor powder-pigment sculpture, dense fields of saturated pigments blur the ability to discern flat from convex or deep hole from shallow depression. Through the use of dry pigments, the artist emphasizes the ambiguity of form. Traditionally, dry pigments are used in conjunction with a binder such as oil, wax, or egg yolk. The early sculptures of Kapoor, however, are void of these binders, leaving the powder-pigment sculptures lightly shrouded in pure color near a state of volatility. Through collaboration, testing, and uncovering visual clues of the artist, a proper method was developed to revive and restore this work of art.

This paper will describe the various methods of testing and the discovery that guided a simple and efficient treatment, breathing life back into one of Anish Kapoor's foundational early works.

### EMERALD LASER LAWN BY DAN CORSON IN THE BROWARD COUNTY PUBLIC ART AND DESIGN COLLECTION

*Tin Ly, Conservation Manager, Public Art and  
Design Program, Broward Cultural Division*

To validate the digital and electronic technology of the 21st Century, the Broward County Public Art and Design program commissioned an ambitious light-based artwork to add to its public art collection. Can such a project be considered to be “permanent” artwork with a minimum 15-year lifespan of 8-hour daily operation? How well can a laser artwork be preserved and maintained by a public art program? What are the unique challenges and rewards?

“Broward Light Project: *Emerald Laser Lawn*” by Dan Corson, a recipient of the 2008 Public Art Year in Review, was installed in an open plaza of downtown Fort Lauderdale, Florida, in early 2007.

Combining laser technology and computer software programming, this interactive artwork consists of 3 lasers projected at low vantage point across the lawn of a 1.8 acre

plaza. It has fascinated the public with its constant mutation of 9 different light sequences and patterns.

Within one year of its operation, the light installation encountered a major set-back when one laser malfunctioned. A lengthy process of restoration ensued.

I will discuss the roles that the artist and conservator play in the long-term preservation of the artwork, along with the team consisting of a fabricator, a computer software designer, and a local service provider in this complicated restoration process.

### PREVENTIVE CONSERVATION AND IDENTIFICATION OF PLASTICS OF A RECENT ACQUISITION AT THE NATIONAL MUSEUM OF THE AMERICAN INDIAN

*Anne Turner Gunnison, Andrew W. Mellon Fellow in  
Conservation, Smithsonian Institution, National Museum of  
the American Indian; Susan Heald, Senior Textile Conservator,  
Smithsonian Institution, National Museum of the American  
Indian; Jia-Sun Tsang, Senior Paintings Conservator, Smithsonian  
Institution, Museum Conservation Institute; and Yoonjo Lee,  
Andrew W. Mellon Fellow in Conservation, Smithsonian  
Institution, National Museum of the American Indian*

In 2009, the National Museum of the American Indian (NMAI) acquired contemporary artist Brian Jungen's *Crux* (*as seen from those who sleep on the surface of the earth under the night sky*) [26/7253], a large mobile comprised of five animals made of plastic luggage, and a wooden rowboat. Mr. Jungen's work is characterized by his use of mainstream consumer goods, perhaps most famously seen in his transformation of Nike Air Jordan shoes into Native Northwest Coast inspired masks.

The installation of *Crux* in the main rotunda of the museum made it necessary to determine appropriate preventive conservation parameters for materials not often found in NMAI's collections. FTIR, a micro-fader tester, and spectrophotometer technologies, were used at the Smithsonian's Museum Conservation Institute, the National Gallery of Art, and at NMAI to identify and characterize the plastics present and determine appropriate exhibit environment and duration for the piece.

Of equal importance to the analysis was the opportunity to consult with Mr. Jungen about his perspectives on the long-term preservation and aesthetic expectations for *Crux*, which guided the conservation approach. Mr. Jungen is well aware of the potential for degradation of the materials with which he chooses to work. While consultations with Native constituent community groups are already standard practice in the NMAI conservation department, working with contemporary artists and their materials, which requires a slightly different approach, is a newer development.

## A NEW APPROACH TO MAINTAINING WATER FEATURES AND ELIMINATING RE-OCCURRING BIOLOGICAL GROWTH OUTBREAKS

*Robert Krueger, Object Conservator,  
Cascadia Art Conservation Center, LLC*

This study is focused on *Fountain*, by Isamu Noguchi in the Nelson-Atkins Museum of Art in Kansas City. Basalt elements of the fountain suffered from a reoccurring algae problem; consequently, an investigation into algaecides was started. A literature study of algaecides revealed that each has the potential for undesirable side-effects. Standard water chemistry tests conducted over an 11-month period revealed the condition of the water was causing the artwork to slowly dissolve. This study led to a focused examination of the water and its constituents as well as the fountain's mechanical system. The goal of the examination was to find a maintenance procedure to ensure the longevity of the sculpted elements and eliminate the potential for algae growth. The water is now balanced with adjustments to the mineral saturation levels and the water's pH, thereby stopping the dissolution of the artwork. By limiting phosphorus—one of the minerals needed in a stoichiometric ratio for biological growth to occur—the algae is eliminated and potentially harmful algaecides are avoided. Variations on this study will be further explored to define the best approach for maintaining water in contact with bronze, stainless steel, and other common elements found in many fountains.

## RE-THINKING THE CLEANING OF CLAES OLDENBURG'S FLOOR CAKE

*Margo Delidow, Sculpture Research Fellow, The Museum of Modern Art; Cynthia Albertson, Paintings Research Fellow, The Museum of Modern Art*

In 1962 Claes Oldenburg created a body of work for his first one-man show at the Green Gallery, New York. Oldenburg, along with his wife Patti Mucha, used a portable sewing machine, heavy weight canvas, cardboard boxes, foam, and acrylic paint to create the now iconic giant soft sculptures in the shape of a hamburger, ice-cream cone, and a giant piece of cake. Since the object's acquisition in 1975, the sculpture has been heavily exhibited, including three transatlantic voyages. There are at least two previous treatments on record for this object—one of which involved surface cleaning with chelating agents. The sculpture has 15 ft<sup>2</sup> of painted cotton canvas, three of which are intended to rest directly on the floor. The resulting conditions of *Floor Cake's* life in a busy museum environment include cracking and paint loss, abrasion, tears and punctures, and extensive surface soiling. Faced with a 47 year old 5 ft-wide by 9 ft-long piece of painted cake, conservators at the Museum of Modern Art were confronted with the re-treatment of Claes Oldenburg's soft sculpture *Floor Cake (Giant Piece of Cake)*.

This paper investigates the effects of past treatment and explores the practical application of surface cleaning acrylic paint, with Claes Oldenburg's soft sculpture *Floor Cake* as a case study. While considerable research has been devoted to the evaluation of the safest and most appropriate method to clean acrylic emulsion surfaces, very little practical treatment experience has been published. This paper aims to contribute to the ongoing surface cleaning discussion by providing a case study example. This research analyzes the effects of past treatments to determine the practical and ethical appropriateness of the cleaning of sculptural objects.

## PLASTER, PLIACRÉ®, AND PAPER

*Mina Thompson and Conor McMahon,  
Associate Conservators, Museum Resources Division,  
Department of Cultural Affairs, New Mexico*

Established in 1909, the Museum of New Mexico ranks among the oldest museums in the Southwest. It also has one of the longest histories of planned and institutional conservation, including the treatment of early Puebloan wall murals in 1933 and the hiring of early staff and consultants such as Per Goldbeck and Rutherford Gettens in the 1950s. This paper traces the history of conservation and conservation practices in the Museum of New Mexico System, from its inception as a single museum for Southwestern art by Edgar Lee Hewett to its current incarnation of seven divisions under the New Mexico State Department of Cultural Affairs. Evolving practices and trends of artifact restoration and preservation are discussed using case studies of archaeological ceramics and Spanish Colonial santos. Analyses of treatment materials, supplemented with archival documentation, uncover past treatment philosophies, some of which are remarkably modern. Retreatment and reexamination of these artifacts, as well as efforts to preserve the intangible aspects of cultural materials, have greatly influenced present-day treatments, including choices made in recent years toward less-toxic and more easily-reversible treatments of these two collection types.

## HENRY MOORE'S BRONZE FORM: INVESTIGATING THE ORIGINAL PATINA

*Katrina Posner, Assistant Conservator for Decorative Arts  
and Sculpture, J. Paul Getty Museum*

Henry Moore's *Bronze Form, 4/6*, was fabricated in 1985 by welding together seven cast-bronze elements. Standing over 13 feet (4 m) tall, the abstract shape was likely polished to a high shine and patinated with ferric nitrate and liver of sulfur to give a uniform, translucent golden appearance. The patina has darkened unevenly over time, primarily due to the loss of protection from surface coatings.

The sculpture was a gift to the Getty Museum and was installed at the Getty Center in May 2007. It was untreated prior to installation due to time constraints and the need for

research into its original appearance. At some point prior to its acquisition, it was coated with a clear acrylic-urethane, which has been compromised by years of outdoor exposure. This coating is highly insoluble in the standard range of solvents.

This talk will discuss investigations made into the sculpture's original appearance based on research at the Henry Moore Foundation and Morris Singer Art Founders, where it was fabricated and patinated. Comparisons will be drawn between the Getty's version of the piece and the others in the series. The surface patinas of two other Moore outdoor bronze sculptures in the Getty's collection will also be compared with *Bronze Form*.

The author will also summarize a conservation roundtable discussion that took place at the Getty in May 2009 with conservators of outdoor works, which was convened to focus on the present state of the surface of the sculpture and discuss possible methods for treatment. This informative discussion addressed the piece itself, but also the ethical questions and the research that is essential when considering the repatination of a work of art.

Finally, the talk will summarize the Getty's proposed treatment for removing the current coating and addressing the aesthetic surface issues.

### **AN EXAMINATION OF PINNING MATERIALS FOR MARBLE SCULPTURE**

*George Wheeler, Columbia University, Graduate School of Architecture, Planning, and Preservation; Carolyn Riccardelli, Associate Conservator, Metropolitan Museum of Art, Sherman Fairchild Center for Objects Conservation; Christina Muir, Mesick Cohen Wilson Baker Architects, LLP, Albany, NY; George Scherer and Joe Vocaturo, Princeton University, School of Engineering and Applied Science*

The use of pins or dowels in repairing stone has been common since ancient times. Conventional wisdom in art conservation suggests that repair materials such as pins or adhesives should have similar properties (such as strength and modulus) to the substrate. Stainless steel continues to be the most commonly used pinning material even though it has a much higher elastic modulus than that of marble. When planning the repair of a sculpture that will remain in a controlled museum environment, the reasons for choosing stainless steel (corrosion resistance, coefficient of expansion) become less important, and thus open up a wider variety of choices for pinning materials. Therefore, a set of tests was designed with the goal of determining the performance of a join made with pins of moduli ranging from 3 to 150 GPa. These pins were set into Carrara marble cores using an epoxy resin adhesive and subjected to compressive-shear stress. Under these conditions, fiber-based rods such as fiberglass and carbon fiber out-performed both stainless steel and titanium in that they were of sufficient strength to withstand the maximum static forces of the sculpture being repaired and did not damage the stone core before pin failure. From these tests, the best-performing pinning materials were used in making

full-scale stone mock-ups to evaluate the overall performance of a pinning/adhesive bond system. Finally, a set of tests was designed to evaluate the tensile and pull-out strength of smooth and threaded pins embedded in marble with an epoxy resin adhesive both with and without a Paraloid B-72 barrier layer.

### **KEEPING THE CIRCLE UNBROKEN: TREATMENT OF DAVID SMITH'S 2 *CIRCLE IV***

*Suzanne Hargrove, Head of Conservation,  
The Toledo Museum of Art*

David Smith's sculpture *2 Circle IV* was prominently displayed at the front of the Toledo Museum of Art when acquired in 2001. Since its creation in 1962, the sculpture was mainly displayed in an outdoor setting. The harsh outdoor environment took its toll on the original yellow, blue, and black paints that Smith hand-applied by brush. Over the years the sculpture was treated in three separate conservation campaigns by three different conservation businesses. In each campaign the conservators treated the sculpture employing the best practice of the time to preserve the remaining original paint. A conservation review of the sculpture in 2005 showed continued surface deterioration of original paint to the extent where it was deemed necessary to treat the sculpture again with the notable decision to move it permanently indoors. This presentation will discuss the co-operation and discussion with the David Smith estate regarding Smith's working techniques and his paint systems. It will include discussions with the conservators that performed the previous conservation treatments regarding their materials and rationale in treatment of *2 Circle IV*.

A new conservation strategy was developed for treating the sculpture with specially formulated paints and techniques to preserve and maintain David Smith's original paintwork. The latest grant-funded conservation work done by contract paintings conservators working with the museum's director, curator, and conservator will be reviewed.

### **THE RESTORATION, TREATMENT, SCIENTIFIC EXAMINATION AND RE-TREATMENT OF AN EGYPTIAN LIMESTONE RELIEF FROM THE TOMB OF KA-APER**

*Kathleen M. Garland, Senior Conservator, The Nelson-Atkins Museum of Art, Kansas City, Missouri; John Tivilly, Conservation Scientist, Hawthorne, NY*

Egyptian limestone sculpture in Western collections has often been subjected to repeated, well-intentioned treatments. Many of these older treatments are the result of a poor understanding of the issues surrounding the removal of sculpture from an archeological setting and placing it

in a poorly controlled museum environment. Remedial treatments often follow, using materials that are in vogue with conservators at the time, without scientifically investigating the causes of deterioration and damage. Subsequent treatments can interact with earlier preservation efforts. An important Old Kingdom Egyptian painted limestone relief from the tomb of Ka-Aper, now in the collection of The Nelson-Atkins Museum of Art, will illustrate past treatment failures and successes, as well as stress the need for consultation and scientific investigation in planning treatments.

The relief had been plastered into a wall, but was removed in some haste by a conservator during a gallery reinstallation in 1991. Severe flaking of the surface required consolidation to withstand dismantling the permanent installation. This treatment resulted in major, unexpected staining. In 2006, the Mellon Foundation funded a scientific study of the deterioration and staining, with re-treatment of the stone in mind. A group of experts from the Metropolitan Museum of Art, the J. Paul Getty Museum, and the Nelson-Atkins established a methodology for the study and treatment of the relief. Mineralogical analyses, pore size measurements, and soluble salt content studies were undertaken. Surface samples demonstrated that prior damage involved flaking applications of a chalk slurry applied in an earlier restoration. Analyses of the organic components of areas with staining or apparent prior consolidation revealed previous applications involving a natural resin, a drying oil, polyvinyl acetate, and cellulose nitrate. The results and the experiences of the consultants with other cases of salt-damaged stone formed the basis for the treatment which will be discussed in detail.

### **THE FIELD MUSEUM ARCHAEOLOGICAL METALS PROJECT: DISTRIBUTED, *IN SITU* MICRO-ENVIRONMENTS FOR THE PRESERVATION OF UNSTABLE ARCHAEOLOGICAL METALS USING ESCAL® BARRIER FILM**

*JP Brown, Regenstein Conservator for Pacific Anthropology, The Field Museum*

Low-humidity microenvironments using polyethylene (PE) and, latterly, polypropylene (PP) boxes with ca. 80 kg/m<sup>3</sup> of desiccated silica gel are widely used in preventive conservation for the storage of unstable archaeological metals. One notable disadvantage of this method is that, because PE and PP are poor moisture barriers, the silica gel must be regenerated annually. The Field Museum has 3,700 unstable archaeological metal objects distributed through its stored collections, requiring an estimated 400 kg of silica gel if PE or PP boxes were used. Instead, we have opted to use Escal® bags, a transparent plastic laminate primarily used for anoxic storage because of its low oxygen transmission rate, but which also is also suitable for low-humidity applications by virtue of its extremely low water vapor transmission rate (comparable to aluminized plastic barrier films). This material has allowed us

to reduce the amount of silica gel to 5 kg/m<sup>3</sup> with a predicted regeneration interval of at least 5 years for iron objects and at least 40 years for copper alloy objects. In other words, the use of Escal® reduces the quantity of desiccant by a factor of 16 and extends the interval between regenerations by a factor of 10. In this paper we discuss the theoretical considerations that led to our choice of Escal® as a barrier film, the practical details of implementation, and report on the progress of the program after the first five years.

### **RESURRECTING A SET OF COMPOSITE TOOLS FROM THE 1ST CENTURY A.D. ROMAN WRECK OF *PORTO-NOVO* CORSICA, FRANCE**

*Paul Mardikian, Head Conservator, Clemson Conservation Center, Warren Lasch Conservation Laboratory, School of Materials Science and Engineering, Clemson University*

The conservation and long-term stabilization of composite artifacts recovered from shipwrecks or submerged archaeological sites remains one of the most difficult problems for object conservators. Holistic conservation strategies are usually required when dealing with complex composite objects. Artifacts that are imbedded in ferrous marine concretions may have corroded together, incorporating foreign materials or small artifacts, and are almost impossible to identify with the naked eye. In these difficult cases, non-destructive identification is necessary using conventional or digital radiographic techniques. In particular, wrought iron artifacts that are subjected to an aggressive marine environment will frequently suffer complete dissolution. A positive of the corroded artifact can usually be made using a molding technique. However, this procedure has rarely been used for a group of tools completely fused together. This paper will present conservation work carried out on composite artifacts recovered from the *Porto-Novo* shipwreck in 1992. This 1st century A.D. Roman vessel, which was carrying about 138 tons of white marble from Carrara, Italy, was discovered off the coast of Corsica in 1991. During the excavation that took place in 1992, a number of large complex concretions were found between the marble blocks. Examination of the concretions revealed the presence of numerous composite objects including hammers, chisels and a rare set of stone carving tools dating from the 1st century A.D. With the exception of carved or sculpted representations, examples of tools like the hammer head are not known. The techniques used to identify and reveal these artifacts will be presented in detail.

## EXAMINING PAST TREATMENTS OF WATERLOGGED BASKETRY FROM THE PACIFIC NORTHWEST AND ALASKA

*Dana K Senge, Objects Conservator, DKS Conservation Services, LLC; Ellen Carrlee, Conservator, Alaska State Museum*

Basketry artifacts fabricated from limb wood, spruce and cedar root, and the inner bark of yellow and western red cedar have been found in water-saturated archaeological sites in the Pacific Northwest since the mid-20th century. These artifacts range in age from a few centuries to more than five thousand years old. The materials retain their overall physical structure due to burial in an anoxic environment, but are degraded on the cellular level. Experiments and treatments performed by archaeologists and conservators over the past 40 years have attempted to stabilize these degraded structures to minimize splitting, crumbing, and distortion of the woven structures as they dried. Early treatments were guided by research done for preserving waterlogged ship timbers from the *Vasa* warship in Sweden and boats from Lake George, New York. Recent research has shown that the size of typical basketry elements limits the use of the PEGCON computer program to determine the level of cellular degradation and that the cellular structure of some basketry material, such as inner bark, differs enough from trunk wood to require a variation in treatment. Recommendations for the best conservation methods for these materials is still under examination as conservators in Alaska, British Columbia, the Pacific Northwest, and scientists at the Canadian Conservation Institute continue to study the woody elements of these artifacts and the effects of treatment products. This paper summarizes and compares past treatments and the current condition of basketry from multiple wet sites on the Northwest Coast, and discusses some of the current avenues for research.

## CONSERVATION AND RESTORATION OF AN EGYPTIAN WOODEN HUMAN-LIKE FORM COFFIN IN SUEZ MUSEUM

*Abdel-Rahman el-Serogy, Lecturer and Conservator, El-Fayoum University, Egypt; Abdel-Salam Eleasely, Lecturer and Conservation Scientist, Conservation Department, Sohag University, Egypt*

This paper discusses the analysis, investigation, conservation, and restoration of a New Kingdom painted wooden coffin that is preserved in Suez Museum. The coffin is almost completely decorated with beautiful painting and inscriptions; the symbolic and symmetrical homogenous distribution of texts and painted illustrations will be discussed.

Analytical investigation of pigments, ground layer, and varnish, was done using SEM-EDS together with XRD and FTIR. A stereomicroscope equipped with computerized remotely-controlled digital camera was a useful tool to investigate the cross sections of pigments and ground layer

of the coffin. Pigments found included malachite, gypsum, chrysocolla, hematite, goethite, and yellow ochre. Gypsum, mud, and clay were used as a ground layer. The same materials used for the ground layer were found mixed with animal glue and used as a stuffing material to fill in the gaps of the wooden structure. Two different types of wood were used to manufacture the coffin. One type of wood was used to make the body of the coffin; a different type was used for the tongue that fastens the cover over the coffin.

Conservation of painted wood has two main requirements. First is the preservation of the genuine colorants and the need to keep the original paints intact. Second is the restoration of losses and reattaching flaking layers to the ground layer. The condition of the wood and paint surface will be discussed. Treatment of separated paint layers and restoration of losses will be described. The coffin was brushed with antistatic brushes to remove the dust. Repair of the loose paint layers was accomplished with a 5% Paraloid B-72 in toluene. Fills were made with suitable stable linen fibers and Paraloid solution.

## USING 3-D PROTOTYPING AS AN INTERMEDIARY IN THE RECONSTRUCTION OF ANCIENT POTTERY

*Renée Stein, Conservator, Michael C. Carlos Museum, Emory University; Susan Blevins, PhD Candidate, Department of Art History, Emory University; Nelson Burke, President, TheEngineerGuy Dot Com; Dr. David Rosen, Director, Rapid Prototyping and Manufacturing Institute, Georgia Institute of Technology; and Andrew Layton, Program Manager, Rapid Prototyping and Manufacturing Institute, Georgia Institute of Technology*

The Greek and Roman Art collection at Emory University's Michael C. Carlos Museum includes a fragmentary black-figure plate attributed to the painter Lydos and a fragmentary red-figure kylix signed by the potter Euphronios and attributed to the painter Onesimos. About one half of the plate survives and all but one fragment join together. The kylix, however, remains as approximately a dozen associated fragments that cannot be joined directly. These important examples are used in teaching and should be placed in the public galleries, but require reconstruction to join the fragments, making the objects stable and the forms more legible. Three-dimensional prototypes of the original vessels were created to serve as intermediaries in the reconstruction process, facilitating molding and filling while minimizing direct handling of the ancient fragments. 3-D prototyping is widely used in industry to model examples prior to initiating costly production. It is also used to reproduce handmade forms, as for jewelry, and has been used by sculpture artists. For this conservation application, a replica of each object was produced from 3-D digital renderings, based upon measurements taken off the objects themselves.

The digital files were then printed as three-dimensional volumes through the precise layering of wax, using equipment that operates much like an ink-jet printer. Silicone rubber molds were then made from the wax prototypes, avoiding the need to mold directly off the ancient fragments. The ancient fragments were then placed into the rubber molds, and the missing portions were cast in place using pigmented plaster. These plaster fills were refined and integrated through limited compensation of the images and patterns. The case study, including images and short videos, was featured in a Museum newsletter and archived on the Museum's website, where it will be accessible for university teaching and public education.

# PAINTINGS

## LET A THOUSAND FLOWERS BLOOM: A PREVENTIVE CONSERVATION COLLABORATION

*Erica E. James, Assistant Conservator of Paintings,  
Museum of Fine Arts, Houston*

The paper is presented in two parts. The first part discusses the conservation of a painting by Anselm Kiefer in the Museum of Fine Arts, Houston (MFAH) permanent collection. The second half discusses how the Kiefer conservation project is reflective of greater collaboration within the field of conservation and the technological and interdisciplinary reliance now employed to conserve paintings.

*Let a Thousand Flowers Bloom*, created in 2000 by Anselm Kiefer, is a painting whose multi-media composition defies standard preconceptions about how a painting ages. Efforts at preventive conservation included discussions of periodic treatments to address both condition, as well as creation, issues. The multi-disciplinary collaboration between specialties over the Kiefer painting is discussed in relation to other Kiefer paintings in the MFAH permanent collection.

This collaboration is demonstrative of changes within the conservation field, and how painting conservators, who once worked in relative isolation, now rely on technology, as well as each other, more and more to understand the work they conserve.

The field of painting conservation has changed dramatically over time. These changes have manifested both practically and philosophically. Practically, the painting conservator now has many duties of which treatment is only one. Interaction *about* the painting has, to some degree, superseded interaction *with* the painting. Truly, there are many exceptions to this, but the resources and opportunities for useful distraction at a painting conservator's disposal are greater than ever. As a result of these distractions, the author examines philosophical changes and theorizes that with more ways to examine paintings providing insight outside of actual treatment, that the field of painting conservation will hold a different meaning to future generations than to past.

## ALICE DIBBLE AND PAINTING RESTORATION IN THE EARLY DAYS OF THE SHELBURNE MUSEUM

*Pamela Betts, IMLS Painting Conservator,  
Shelburne Museum, Shelburne, VT*

In the late 1950s, as the collection of paintings at the Shelburne Museum continued to grow, founder Electra Havemeyer Webb relied on painting restorer Alice Dibble to prepare select paintings for exhibition. Alice and her husband, Win, owned a gallery in Shoreham, VT, almost an hour's drive from Shelburne, where they offered "picture framing, antiques, paintings restored, (and) leaf gilding." Traveling to and from the museum, sometimes transporting paintings back to her studio, sometimes working *in situ*, Alice performed a full

range of painting and frame restoration services. Alice would continue to treat the paintings at the Shelburne Museum long after Mrs. Webb's death in 1960. According to the existing information in the archives at the Shelburne Museum, Alice worked on over 150 paintings over the course of two decades, in tandem with the treatments of many paintings and frames belonging to other clients in her busy practice. Alice helped to preserve many fine examples of American painting, today an important part of the collections at the Shelburne Museum. This paper will examine some of the paintings treated by Alice as well as other restorers in the early days of the Shelburne Museum and how they have fared over time.

## A NEW APPROACH TO THE TREATMENT OF FATTY ACID CRYSTALS ON MODERN OIL PAINTINGS

*Kathleen A. Martin<sup>1</sup>, Bonnie Rimer<sup>2</sup>, Joseph Barabe<sup>1</sup>, Carol Injerd<sup>1</sup>. <sup>1</sup>McCrone Associates, Inc.; <sup>2</sup>Rimer Fine Art Conservation, Chicago, IL*

Fatty acid crystals found on the surfaces of modern oil paintings are thought to be the result of the migration of free fatty acids through a paint layer followed by exudation at the surface. The exudates may then crystallize, resulting in disfiguring white patches on the paint surface. The fatty acid crystals are generally identified as palmitic acid, stearic acid, oleic acid and/or azelaic acid, and originate from the paint medium or from additives in the paint.

Past attempts by conservators to remove the crystals, including brushing them from the surface, swabbing with solvents, heating and buffing the affected area, and the application of varnish, have been shown to be only temporarily effective in most cases resulting in a return of the crystals over time. Repeated treatment may result in damage to the paint layer, and the application of varnish may be inconsistent with the artist's aesthetic.

Our approach is inspired by skin care models, where treatment of dry cracked skin may involve the use of glycerin, which is thought to act by transforming solid lipid crystals into liquid crystalline phases. For paintings, this means applying an appropriate material that will solubilize or disperse the solid fatty acid crystals, rendering them less visible without perceptibly altering the surface of the paint layer. The chosen materials should be stable and reversible.

In this talk, we describe the results of treatment tests using various materials in an attempt to solubilize and/or disperse fatty acid crystals. Tests are carried out on artificially generated fatty acid crystals and naturally aged paint outs of oil paints from different manufacturers that exhibit crystals.

## TWO PORTRAITS BY GIACOMO CERUTI, AN EXAMINATION

*Jean Dommermuth, Institute Lecturer for the Conservation Center, Institute of Fine Arts, New York University, and Helen Spande, Conservation Coordinator, Villa La Pietra, New York University, Florence, Italy*

Two paintings by Giacomo Ceruti, (1698-1767) in the Acton Collection, Villa La Pietra, New York University, Florence, are considered. As part of a basic maintenance treatment, these oil-on-canvas portraits were examined using only simple, inexpensive, non-invasive methods. Before the examination, the paintings were notable for their high quality, large-scale, and unvarnished surfaces, but, on closer inspection, also displayed a wide variety of virtuosic paint handling. It was decided to compare the observations made during this examination with published information on painting materials and techniques. While Ceruti himself has been little studied technically, the extensive information about related artists proved enlightening. This research, in combination with close visual comparison with other works by the artist, has created a good picture of the painting materials and methods used.

Called *il Pitocchetto* (the Little Beggar) for the depictions of peasants and workers for which he is best known, Ceruti also painted a large number of aristocratic portraits such as the Acton pair. However, a relative lack of written evidence about the artist leaves considerable gaps in his biography and understanding of his oeuvre. In light of this, the physical evidence of the paintings themselves may provide a key to understanding them as well as the painter's training, development, and influence. From this study, Ceruti emerges as not only a facile and fluent painter but also one with a sophisticated and innovative approach to materials.

## APPROACHES TO RECONSTRUCTION AND PRESENTATION OF VERONESE'S "BUTCHERED" PETROBELLI ALTARPIECE

*Stephen Gritt, Chief Paintings Conservator, Head of the Department, and Tomas Markevicius, Paintings Conservator, National Gallery of Canada, Ottawa*

In 1563, Paolo Veronese painted one of the largest and iconographically complex altarpieces of the sixteenth century. At the end of the eighteenth century, the painting was cut up. Two fragments were converted into saleable works by overpainting and another by enlargement. Since then, the "independent" paintings have moved through various collections to eventually find institutional homes.

During the 19th century, three fragments remained linked, but no attempt was made to understand the larger painting. Sketched and montaged reconstructions were made from the late 1920s, but recently the fragments have physically intersected in an international traveling exhibition, with the critical addition of a fourth lost fragment.

A crucial aspect of the project was the comprehensive

treatment of the largest fragment, which was rarely on view due to condition issues stemming from asymmetrical cropping, and damage resulting from being swamped by seawater during transit in 1924. Additionally, examination and research made sense of the genesis of the painting, established accurate shape and scale, and was logistically vital to physically reconstructing the altarpiece and transporting it to each of the venues. Two other paintings by Veronese in the NGC collection were included in the technical study.

The main focus of the article is the treatment of two of the fragments and attendant methodological issues. The Ottawa fragment required technically demanding non-standard solutions, and the Blanton fragment still bore desirable residues of its c. 1800 enlargement. These fragments would then be placed alongside the two others (London and Edinburgh), which were last restored in 1991 and 1958 respectively, and still the loss to the Altarpiece would be in the realm of 20 percent.

## TECHNICAL EXAMINATION AND TREATMENT OF THREE PANELS OF A PREDELLA BY SASSETTA

*Serena Urry, Former Associate Conservator, Detroit Institute of Arts*

In 1437 the Franciscan friars of the town of Borgo San Sepolcro commissioned Sienese artist, Stefano di Giovanni, called Sassetta (1395-1450), to produce a large, two-sided altarpiece for their church. Installed in 1444, the altarpiece was dismantled between 1578 and 1583. Three of the four scenes from the Passion of Christ cycle that formed one side of the predella are now in the collection of the Detroit Institute of Arts. Basic assumptions about early Italian predella box construction and remnants of the original carpentry, such as nails, nail holes, joins, etc., in all three panels allowed extrapolation of the original length and appearance of the predella, and contributed to the reconstruction of the altarpiece as a whole.

*The Agony in the Garden, The Betrayal of Christ, and Procession to Calvary* were accessioned in 1953, 1946, and 1924, respectively. While the panels have all suffered wear consistent with their age, they are nevertheless in quite disparate states of preservation with respect to surface and structure. The Agony panel retains its original thickness. The *Betrayal* panel retains its original thickness but has been trimmed on all four sides. The *Procession* has been thinned and cradled, but retains much of its engaged frame. Damage to the surface of each scene is likewise different in each. Some is the result of structural problems, such as interior nails and joins. Other deterioration is due to the materials and/or technique, such as the extensive use of silver leaf. Further damage is a result of chemical cleaning, while other losses are apparently the result of vandalism. All stages of each conservation treatment were served by having contemporaneous panels by the same artist to consult, and by the fact that the *Agony* and the *Betrayal* are chronologically close, having identical landscapes and many of the same figures.

## THE CONSERVATOR AS AN EXPERT WITNESS, WITNESS, OR PARTY IN LITIGATION

*Patricia M. Dillon, President, Putnam Art Advisors &  
Consultants, Greenwich, CT*

Conservators become entangled in art law litigation involving claims of authenticity or damage and loss. In either instance, conservators are the key witnesses upon whose testimony jurors and/ or judges will base their verdicts.

Acting as an expert witness can be financially rewarding and enhance a professional's resume. It can also be draining, humiliating, and potentially derail a promising career.

While it is said that "appraisers" are arbiters of value, they are unable to designate value without the input of a conservator. The conservator must identify the type and extent of the damage; determine if the piece can be conserved; the financial cost of the same; and make a final determination of the overall loss of percentage value to the work.

Sometimes a conservator will testify as a "pure expert" – someone who reviews the works of others or who reviews a hypothetical. Sometimes a conservator must testify as the professional who rehabilitated the piece. Increasingly, conservators can also be parties to a lawsuit. In each instance, the testimony and approach to the witness is different and the conservator must be prepared for his testimony and cross-examination.

Moreover, litigation is unpredictable. If you sign on for a project and a paycheck you must be prepared to write the report, ultimately testify and to stand by your words and actions.

We will examine how a conservator should prepare for testimony, how to prepare the attorney, how to write a report, and how to be prepared for the inevitable pitfalls such as cross-examination or pitfalls in your paperwork. We will also review VARA and what to do when a living artist is not supportive of your conservation efforts.

## REFLECTIONS ON THE PRIMACY OF THE IMAGE IN CONNOISSEURSHIP AND CONSERVATION

*Laszlo Cser, Restorart Inc., Toronto, Canada*

*"In 2002 Canadian businessman Ken Thomson set in motion one of the most significant acts of philanthropy in Canadian history when he agreed to donate his priceless art collection to the Art Gallery of Ontario in Toronto. The Collection of over 2,000 Canadian and European paintings and objects will be housed in a series of magnificent galleries in a transformed AGO designed by the world-renowned architect, Frank Gehry." ©The Thomson Collection 2008*

Over the course of 18 months during 2007 and 2008, over 600 works of art, mostly Canadian paintings of the highest cultural and heritage values, were examined and treated in preparation for the Thomson Galleries at the Art Gallery of

Ontario. David Thomson, his son, envisioned and directed innovations in framing and installations in the galleries that are revolutionary in their concept and presentation of historical paintings and First Nations artifacts.

The many conversations and observations with Kenneth and David Thomson, and subsequent internal dialogues in solitude at the bench, became an exploration of what locates us as conservators in the landscape of aesthetics and historicity. As the primacy of the image gives value to the immediacy and meaning of the aesthetic experience, so does authenticity give value and meaning to the deliberations of historical materiality and contextual relationships. Is there an altar of sacrifice if faced with choosing one over the other?

In any given situation, whether one sides for the primacy of the image or authenticity, or settles in the space between, the decisions taken become a testament of the relationship between the collector and the conservator. The general aspects of the Thomson Project will be outlined from inception to completion with examples and commentary on a new vision for the presentation of historical art.

## EDUCATION AS THE BASIC TOOL OF CONSERVATION IN THE 21ST CENTURY

*Eugenia Guidobono, National University Institute of Art,  
Buenos Aires, Argentina*

Since the beginning of the 21st century, priorities in the field of conservation of cultural heritage have changed worldwide. Not long ago people believed that the best way of preserving heritage was to restore it, especially in Latin America. But with the new trends of preventive conservation, conservators have understood that priorities lie with collections as a whole. Preservation is no longer exclusively for conservators but a shared responsibility of the community. We are all responsible for the transmission of our culture to the future.

The redefinition of priorities in the conservation field and the intervention assessment are ethical issues. Education, diffusion, and the transmission of knowledge are of utmost relevance for these changes to be reflected in institutions and in their collections.

This investigation began when I started wondering about the condition of collections in public museums in the province of Entre Ríos and the possibility that their state of preservation was the result of people working in museums with little or no education in the field.

In order to test this supposition, I chose one museum in each district of the province and visited them. Photographic documentation and written reports of the situation were made and interviews with the museum staff were taken. By assessing the information obtained from 16 public museums I noticed the lack of awareness with regards to the need of preventive conservation. I also realized that the training of museum employees is very scarce and this affects collections: the human factor becomes the most important one regarding deterioration in public museum collections in this province.

In order to find the origin of this problem, I studied the educational, political and legal fields—among others—and realized that the causes are directly related to the lack of professional education, legislation, suitable institutional policies protecting cultural heritage and most important of all *the lack of education about the importance of preserving cultural heritage*.

### DARE GREAT THINGS\*: QUESTIONS ON THE RESTORATION OF A SERIES OF COLONIAL PAINTINGS

*Federico Eisner-Sagüés, Conservation Scientist and Carolina Ossa-Izquierdo, Painting Conservator, Centro Nacional de Conservación y Restauración, Santiago de Chile*

The *Serie Grande de Santa Teresa* is part of the patrimony owned by the *Monasterio del Carmen de San José* in Santiago de Chile. It's a series of seventeen paintings (200 x 250cm), from the late 17th century. The paintings are based on another series conserved in Santa Teresa Convent in Cusco, painted by Espinoza de los Monteros, who used Flemish engravings as iconographic source.

Big restoration projects used to focus on technical solutions, forgetting that there are many different people involved with the objects. Owners, financiers, curators, conservators, scientists, historians, and the community all try to assert their own vision upon the objects.

This project was financed by a private institution and executed within a governmental conservation center. Each person's role and motivation in this project will be discussed.

Given this context, we wondered who we are restoring for, what intervention criteria we should assume, and how far we can go investigating history and materiality versus restoration deadlines.

Our interdisciplinary approach to restoration was conducted by conservators and assisted by conservation scientists, historians and photographers. The studies were made during the intervention, while considering that we were studying a workshop creation.

The gathered body of information is large and diverse, giving us a good idea of the material composition and technology used. In most cases results are coherent with historic and scientific references for colonial Peruvian art. Some exceptions and unanswered questions are still up for discussion, giving us a good starting point for further investigation on colonial art.

In 2009 the paintings were shown in the National Fine Arts Museum, and a book was published that resume all the research done about the paintings.

\*From the homonymous poem of Saint Teresa.

### FLEXIBLE THERMAL BLANKET AND LOW-PRESSURE ENVELOPE SYSTEM IN THE STRUCTURAL TREATMENT OF PAINTINGS ON CANVAS

*Nina Olsson, Conservator in Private Practice, Portland, Oregon, and Tomas Markevicius, Paintings Conservator, National Gallery of Canada, Ottawa*

From the 1950s onwards the use of new systems applying low pressure, vacuum, and heating were introduced, and since the 70s have been developed rapidly, becoming a common practice today. Most of the lining techniques applied today involve using a vacuum or low pressure heating table, which in most cases is expensive, limited in its application size, and can be used almost exclusively in a fixed location.

What if you could roll up your heating device like a blanket and take it to your work site when treating a large format painting?

An experimental method using fast-responding, flexible, thermal silicone rubber blanket offers greater versatility and precision treating both large-scale and conventional paintings, and could be used as an alternative to the heating table. In 2003, a silicon thermal blanket, custom designed by Instrumentors Supply was applied for the onsite treatment of two large-scale mural paintings by Howard Sewall (1899–1975) in Portland, Oregon. This method was later used in the treatment of other paintings by Willem van Aelst (1626–1683), by Paolo Veronese (1528–1588), and various WPA murals treated by the authors and other art conservators. From the preliminary results it is apparent that along with the impressive versatility and unlimited size, the thermal blanket also offers considerably shorter heating and cooling times and a more uniform heat distribution over the surface, with fewer “hot” and “cold” spots common in conventional heating tables. The proposed paper examines the method in use and the results of diverse case studies treating selected paintings, which vary in their size, materials, techniques, and period.

### UP IN SMOKE, TREATMENT OF FIRE-DAMAGED PAINTINGS

*Rustin Levenson, Chief Conservator, Veronica Romero, Conservator, and Kelly O'Neill, Assistant Conservator, Rustin Levenson Art Conservation Associates, Miami, FL*

In December 2007, a fire destroyed the Harold Golen Gallery in the arts district of Miami, Florida. 178 burned and smoke-damaged paintings were brought to our studio for treatment. The paintings, all less than 15 years old, were a range of oil, commercial, and acrylic mediums, varnished and unvarnished. Most of the works were owned by the artists. Treatments focused on the removal of fire accretions, primarily organic and inorganic carbon. An early, surprising finding was that the use of rubber sponges, often recommended for treatment of smoke-damaged paintings, actually complicated further removal of surface accretions.

Traditional conservation surface cleaning formulas such as naphtha emulsions and EDTA and ammonium citrate in distilled water were successful with some of the paintings. When these traditional remedies failed, the conservators received permission from the artists to do further experimentation with the works. A range of commercial products were tested on the irretrievably damaged pieces. One of the most successful was De-Greaser #88 (ethylene glycol monobutyl ether) obtained from Home Depot. The presentation will discuss the logistics of overseeing 178 treatments, the observations of the conservators, the successful treatments on the various mediums, and outline the results of the experimental materials used on the fire-damaged paintings.

### EVALUATION OF CLEANING AGENTS FOR ARTISTS' ACRYLIC PAINTS WITH THE AID OF HIGH-THROUGHPUT (HTP) TESTING

*Alan Phenix and Thomas J.S. Learner, Getty Conservation Institute, Los Angeles, CA; Melinda H. Keefe, The Dow Chemical Company, Midland, MI; Bronwyn Ormsby, Tate, London, UK*

At AIC's 2009 Annual Meeting in Los Angeles, we presented the first outcomes of a collaborative research project between the Getty Conservation Institute (Los Angeles), Tate (London), and scientists at The Dow Chemical Company (Midland, MI) which sought to apply Dow's high-throughput (HTP) automated analysis and testing facilities to the problem of evaluating surface cleaning preparations for artists' acrylic paints. The focus of that initial presentation was the development of the HTP test methods for measuring cleaning efficacy, the influence of cleaning agents on the mechanical properties of paints, and for analyzing surfactant residues, as well as approaches to data analysis.

In this paper we present further results on the influence of various formulation parameters on the efficacy of surface cleaning preparations for artists' acrylic paints, obtained using some of the HTP methods described previously. Specifically, the aim of the paper is to report results of studies of the influence on cleaning efficacy for aqueous systems, of parameters such as: pH; conductivity; surfactant type and concentration; chelate type and concentration; and combinations of these variables. The studies to be reported will introduce some surfactant products that are relatively new to conservation, including:

- Dow specialty ethoxylate surfactants (readily biodegradable, nonionic, green alternatives to APE surfactants)
- Ethylene oxide/butylene oxide diblock copolymers (biodegradable nonionic).

Given the generally low impact of non-polar (i.e. aliphatic hydrocarbon) solvents on artists' acrylic paints, cleaning systems based on these liquids have also been investigated.

Results will be presented of the influence on the cleaning efficacy of hydrocarbon solvents caused by additions of surfactants, etc. Additionally, the paper will report results of investigations into novel water-in-oil microemulsions. Some background theory on microemulsions will also be offered, by way of introduction to this class of water/surfactant/solvent system.

### A QUESTION OF TECHNIQUE: CONDITION ISSUES ASSOCIATED WITH LAYERING STRUCTURE IN RICHARD DIEBENKORN'S OCEAN PARK SERIES

*Ana Alba, Postgraduate Fellow and Susan Lake, Director of Collections Management and Chief Conservator, Hirshhorn Museum and Sculpture Garden, Smithsonian Institution; Mel Wachowiak, Senior Conservator, Museum Conservation Institute, Smithsonian Institution*

When Richard Diebenkorn's *Ocean Park No. 111*, 1977, was requested for loan, subsequent examination revealed a complex pattern of lifting cracks that extends over most of the surface of the painting. Examination of other paintings in the artist's Ocean Park series revealed that some of these had condition issues similar to those of *No. 111* while others did not. The goal of this research project is to determine the factors that may have contributed to the severe condition issues of the Ocean Park paintings.

Richard Diebenkorn's Ocean Park series began late in the year 1967 while working in his studio in the Santa Monica Ocean Park district. The series includes about 150 paintings executed over the next 25 years. Cross sections of the painting layer structure revealed that the artist first applied a heavy, clear resinous coating to the cotton canvas support followed by a white ground. FTIR was used to identify the ground as an acrylic gesso and the paint medium as oil. In an effort to determine whether or not Diebenkorn's choice of materials, his working method, or a combination of the two is responsible for the pervasive cracking seen in *No. 111*, additional Ocean Park paintings from around the same time period were examined.

Analysis to be presented includes comparisons of samples from some paintings affected by the cracking to samples from paintings of the same time period that are in excellent condition. The comparisons suggest a relationship between the cracking and the layering structure of the paintings. In many of these paintings, it was also observed that localized cracking appears to be related to color area and design. The effect of pigment type and aspects of the artist's technique, such as scraping or thickness of application, on paint layer stability will also be considered.

## DO WEAVE MATCHES IMPLY CANVAS ROLL MATCHES?

*Don H. Johnson, Department of Electrical & Computer Engineering, Rice University; Ella Hendriks, Conservation Department, van Gogh Museum; Muriel Geldof, Netherlands Institute for Cultural Heritage; C. Richard Johnson, Jr., School of Electrical & Computer Engineering, Cornell University*

Our computational algorithms for measuring thread counts and angles in both warp and weft directions from scanned x-ray images produce “maps” of these variables across entire paintings. Using the van Gogh Museum’s collection as a basis, 183 of van Gogh’s paintings have been incorporated into a database and their weave patterns compared. Using only warp matches, we found a clique of twenty-three weave-matched paintings. By reconstructing the smallest section of canvas that could have produced these aligned paintings, they must span the entire width of a commercial canvas roll (2 meters) and at least 7 meters of length.

Current dating places these 23 paintings during van Gogh’s late French period from January 1889 to July 1890. For example, three late-period (Auvers) paintings—F778, F779, and F816 in de Faille’s catalog—matched in warp and all three pictures were made in July 1890. Ground sample analysis from two of these paintings indicates use of the same ground material (the third has not yet been sampled). Matching this group is F458, one of van Gogh’s *Sunflower* copies dated to January 1889 based on style and mention in the artist’s letters. This painting’s ground layer differs from the three later works, confirming that whilst their weave patterns match, their supports were not cut from the same commercially primed roll. During this time, van Gogh preferred “ordinary” canvas from the Paris firm Tasset et L’Hote. Our hypothesis is that looms were very consistent in the warp direction, reproducing weave patterns in bolts of canvas produced over a period of time. Consequently, other types of evidence—detailed physico-chemical comparison of ground layers, patterns of primary cusping, reconstructions of van Gogh’s receipt of canvas rolls, and art historical/stylistic evidence—all need to be brought to bear to translate weave matches into canvas matches.

## VISIBLE AND INFRARED IMAGING SPECTROSCOPY OF PAINTINGS: PIGMENT MAPPING AND IMPROVED INFRARED REFLECTOGRAPHY

*John K. Delaney<sup>1</sup>, Jason G. Ziebal<sup>2</sup>, Roy T. Littleton<sup>2</sup>, Mathieu Thoury<sup>1</sup>, Michael Palmer<sup>1</sup>, Kathryn Morales, and E. Rene de la Rie.<sup>1</sup>*  
<sup>1</sup>Scientific Research Department, National Gallery of Art; <sup>2</sup>U.S. Army Night Vision & Electronic Sensors Directorate

Imaging spectroscopy, the collection of images in narrow spectral bands, has been developed for remote sensing of the Earth utilizing reflectance or luminescence. In this talk we present findings on the use of imaging spectroscopy to

identify and map artist pigments as well as to improve the visualization of preparatory sketches. Two novel hyperspectral cameras, one operating from the visible to near-infrared (VNIR) and the other in the shortwave infrared (SWIR), have been used to collect diffuse reflectance spectral image cubes on a variety of paintings. The resulting image cubes (VNIR 420 to 970 nm, 240 bands, and SWIR 950 to 1700 nm, 85 bands) were calibrated to reflectance and the resulting spectra compared with results from a fiber spectrometer (350 to 2500 nm). In addition, a calibrated luminescence multispectral camera (600 to 950 nm, 8 bands) was used to obtain luminescence spectral image cubes after exciting the painting materials in the blue. False color reflectograms, obtained from the SWIR hyperspectral images, of extensively reworked paintings such as Picasso’s *The Tragedy* (1903) are found to give improved visualization of these changes. Spectral image processing on the VNIR and SWIR image cubes are found to be useful in identifying the primary pigments. Kubelka-Munk theory was used on some of the data to determine the composition of the mixtures. For example, the primary pigments and their distribution in Picasso’s *Harlequin Musician* (1924) and *Peonies* (1901) were determined and compared with X-ray fluorescence data. The results show that inclusion of the NIR and SWIR reflectance along with the luminescence provides for a more robust ability to assignment of pigments than using visible spectroscopy alone.

## HISTORICAL AND ANALYTICAL LITERATURE REVIEW ON DRIERS USED IN LATE 19TH AND EARLY 20TH CENTURY PAINT FORMULATIONS

*Anna Vila, Ph.D, A. W. Mellon Conservation Science Fellow, The Art Institute of Chicago; Margaret G. MacDonald, Ph.D, Conservation Science Fellow, National Gallery of Art*

Historically, certain pigments were noted to have a drying effect on drying oils and were frequently added as an ingredient in artist paints. Artists’ recipes in the mid-eighteenth century called for compounds containing lead, zinc, copper, and manganese to be mixed in to aid in drying time. By the nineteenth century, colormen sold products known as “driers” containing premixed oil and driers in bladders and, later, metallic tubes\*.

These early recipes led the way to manufactured artists’ tube paint and house paint in the late-nineteenth and early-twentieth centuries, of interest in the present paper. To identify and address the evolution of paint formulations manufactured in this period, this presentation will carry out an exploration of the incorporated driers. Therefore, the aim is to identify and catalog compounds, such as metallic soaps (metallic fatty acid salts), which were employed commercially as driers in late-nineteenth and early-twentieth century oil paint. Paint manuals, notebooks from paint factories, and ancient and contemporary paint catalogues have been collected and will be presented. In addition, a technical study has been undertaken to analyze

driers in paint samples from this period. Identification of driers could aid in the differentiation of artists' tube paint from house paint and individual manufacturers and play an important role in understanding the materials for the conservation field.

This work arose out of on-going research on paint driers and will be restricted to oil paint and painting manuals from the end of the nineteenth and the first half of the twentieth century with consideration of characterization methods and conservation strategies.

\*Carlyle, L., *The Artist's Assistant: Oil Painting Instruction Manuals and Handbooks in Britain, 1800-1900, With Reference to Selected Eighteenth-Century Sources*. London: Archetype Publications Ltd., 2001.

# PHOTOGRAPHIC MATERIALS

## AN EARLY DAGUERRETYPE BY HENRY FITZ, JR.

*Hanako Murata, Assistant Conservator of Photographs,  
The Metropolitan Museum of Art, New York*

The Metropolitan Museum of Art acquired the Gilman Paper Company's photography collection in 2005. Among the extraordinary works in this collection is one of the few known daguerreotypes by Henry Fitz, Jr. (1808-1863), whose condition presents unusual challenges.

Fitz is famous for his early innovation of lenses for telescopes and daguerreotype cameras as well as one of the first known daguerreotype self-portraits now in the collection of the National Museum of American History, Smithsonian Institution. In 1840 he established his photography gallery studio in Baltimore, Maryland, and continued making daguerreotypes through 1842. This ninth plate, a portrait of a gentleman, is dated circa 1840 and is housed in a black leather case with the brass mat embossed "H. FITZ JR. FECIT BALT."

The atypical characteristic of this work is that the left side of the copper plate is split into two layers resulting in a Y-shaped cross-section view. The image surface shows a vertical line under raking light representing the border of the split. The edges of the plate indicate that the plate may not have been made from only two layers, but possibly is a composite of multiple copper sheets.

This paper will provide an introduction to Henry Fitz Jr. and present further investigations into this unusual plate from the beginning of the daguerreian era. Results of analysis and challenges in housing and preservation will be discussed.

## THE CONSERVATION PROJECT OF THE MANILA DAGUERREOTYPES

*Caroline Barcella, Andrew W. Mellon Fellow, Fifth Cycle  
Advanced Residency Program in Photograph Conservation*

In April 2007, an exceptional group of eighteen daguerreotypes were discovered in the collections of the Hispanic Society of America in New York City. The group included thirteen whole plates and five half-plates, presenting remarkable views of Manila city and its surroundings. They most likely constitute the first photographic records of the Philippine Islands. Discovered in partially opened or incomplete housings, these fragile objects were vulnerable to irreversible damage due to simple neglect and careless handling.

To preserve this important heritage, the Photograph Conservation Department at George Eastman House offered to undertake the stabilization of the group. The conservation project lasted eighteen months and involved the work of six Mellon Fellows from the Advanced Residency Program in Photograph Conservation (ARP), as well the contribution of conservators and scientists from various institutions.

Several notable achievements of the project were the

establishment of a documentation protocol adapted to French daguerreotypes housings, development of a stabilization system of the plates in their original housings, and techniques to reproduce the format of some original painted and decorated cover glasses. These three aspects benefited from the creation of didactic tools (guidelines, detailed instructions, and videotaping) for dissemination to the field for similar challenges of documenting and treating French daguerreotypes.

This presentation introduces the Manila Daguerreotypes and their historical context, and describes how the detailed examination of individual objects revealed additional information regarding the material history of the group. It will discuss the didactic tools developed during the project. The final section will synthesize the conservation interventions performed to document, stabilize and ensure the long-term preservation of the Manila Daguerreotypes.

## RE-EXAMINING THE (ELECTRO-) CHEMICAL CLEANING OF DAGUERREOTYPES: MICROSCOPIC CHANGE VS. MACROSCOPIC PERCEPTION

*Ingrid Gerritsen, Conservator, Formerly: Netherlands Institute for  
Cultural Heritage, Currently: National Museum of Ethnology,  
Leiden, The Netherlands; and Clara von Waldthausen, Private  
Conservator, Fotorestauroeratelier Clara von Waldthausen,  
Amsterdam, The Netherlands; W. (Bill) Wei, Senior Conservation  
Scientist, Netherlands Institute for Cultural Heritage,  
Amsterdam, The Netherlands*

The Netherlands Institute for Cultural Heritage (ICN) has started a project looking at the effect of (electro-) chemical cleaning of daguerreotypes on their appearance. The objective of the project is to assist conservators in finding methods and parameters which can be "safely" used for cleaning these unique objects. The project not only includes scientific testing and surface analysis, but also considers the ethical issues of cleaning including the definition of what "clean" or a "good result" is for a daguerreotype, readability, and (loss of) value.

Initial results indicate that daguerreotypes can be electrochemically cleaned under cathodic polarisation at a particular constant potential. In general, this is a procedure typically used in industry, and should theoretically be a "safer" procedure than the current method using alternating polarisation. However, surface changes can be seen at a microscopic level for both electrochemical methods. In both cases, the visual result could be considered "good." Work in this project is continuing to relate measurements of "objective" microscopic changes with how treated daguerreotypes are perceived.

## CHALLENGE AND STRATEGIES IN THE PRESERVATION OF PHOTOGRAPHIC COLLECTIONS: HERE, THERE, AND EVERYWHERE ACROSS THE UNIVERSE

*Debra Hess Norris, Henry Francis du Pont Chair in Fine Arts,  
Chair & Professor, Department of Art Conservation,  
Vice Provost for Graduate and Professional Education*

Photograph collections, from salted paper prints to cellulose acetate film base negatives, housed in museums, libraries, archives, historic sites, and scientific repositories are at risk nationally and internationally. In the United States, results from the Heritage Health Index (HHI) confirm the urgent need for improved storage conditions, site-specific disaster plans and emergency response training, increased preservation staff, and sustained funding for collections care. HHI revealed that there are 727 million photographic items being cared for by U.S. collecting institutions. More than 40% of these collections are in unknown condition whereas 21% are in need or urgent need of preservation.

Photographic preservation challenges are not as thoroughly documented but clearly present in museums and libraries – large and small – throughout the world. From libraries in Africa to museums in Asia, resources and opportunities for proper photograph preservation and conservation training are lacking and public awareness must be strengthened.

This presentation will summarize the results of the October 2009 Salzburg Global Seminar. This seminar, sponsored by the Institute of Museum and Library Services, convened an international group of 60 cultural leaders and conservation and preservation specialists representing 32 countries to develop effective strategies to optimize collection conservation, increase funding, and intensify public awareness. One primary goal of the Salzburg Global Seminar was to develop effective ways to promote the practice of conservation and to implement best collections preservation practices within a wide variety of cultural contexts.

The proposed presentation will connect conservation challenges associated with photographic collections in the United States and beyond with the outcomes from the Salzburg Global Seminar to suggest possible preservation and educational strategies and to promote increased international collaboration and partnerships.

## NPS SERVICE-WIDE INITIATIVE FOR THE PRESERVATION OF FILM-BASED MEDIA: UPDATE AND PRESENTATION OF MULTIMEDIA TRAINING PROGRAM

*Jenny Barton, Museum Specialist,  
National Park Service, Harpers Ferry Center*

The National Park Service has an estimated 15 million film-based photographic images in its museum collections, many of which are cellulose nitrate, cellulose acetate, and

color materials. It is well known that these materials are highly susceptible to deterioration when not stored in a cold environment. In an effort to practice proper stewardship and improve storage environments for its film-based photographic collections, the NPS embarked on an unprecedented, multi-year project to implement cold storage.

This project, now in its third year, was developed to meet best preservation practices while accommodating the unique conditions at 391 individual NPS sites. To implement this valuable preservation strategy, the NPS is using upright freezer units and cold storage vaults. Additionally, the NPS developed a vapor-proof packaging design for use in freezers and vaults that lack humidity control. Successful implementation is largely dependent upon the development of individual cold storage plans for sites with collections ranging in size and scope. To help the NPS accomplish project goals, a variety of training materials were developed for staff with collections management responsibilities. These resources included a new interactive multimedia program (DVD) that was recently distributed to staff at all NPS sites, and is available on the web. The program contains still images, downloadable documents and videos with step-by-step packaging demonstrations. Users will benefit from expert guidance during each phase of the implementation process. A web-based version of the program is available to the public via the NPS.gov website.

This presentation will summarize the progress of the ongoing NPS service-wide film preservation initiative and will include a presentation of the new DVD training program focused on cold storage implementation for film-based photographic collections.

## A STUDY IN PHOTOGRAPH CONSERVATION PROBLEM RESOLUTION: A CONSERVATION PLAN FOR THE MEXICAN SUITCASE

*Mirasol Estrada, Andrew W. Mellon Fellow, Fifth Cycle  
Advanced Residency Program in Photograph Conservation*

This case study describes the development and execution of a preservation plan for the *Mexican Suitcase*<sup>\*</sup>, an important group of 35mm film rolls and their historic housing. The challenges encompassed accessing the historic image content and developing a long-term preservation proposal for this unique group of associated photographic objects.

The metaphorical “suitcase,” held by the International Center of Photography, is an intricate object consisting of three mat board boxes and about 125 nitrate 35mm film rolls.

A visual examination of the film rolls showed them to be in fair condition. The primary consideration was preventing damage during handling of the tightly curled rolls; a secondary concern was the already-broken sprocket holes and the cut filmstrips that mark certain frames. The challenges, in order of priority, were to safely access the image information and to propose a suitable storage method.

The key was the Planar Film Duplicating Device (PFD2),

which held the film flat in only select areas, thus avoiding stress to the whole strip of film. This device was extremely gentle with the material while allowing the recording of all image information.

The value of the Suitcase's original storage format suggested an unusual preservation proposal: a recommendation that the nitrate film rolls be stored in their existing curled state in replacement mat board boxes that retained the original order and handwritten information. Meanwhile, conservation treatment would stabilize the original containers.

Contributors: George Eastman House: Grant Romer and Inés Toharia Terán; Image Permanence Institute: James Reilly, Doug Nishimura, and Jean-Louis Bigourdan; International Center of Photography: Cynthia Young and Chris George.

\*35mm photographic negatives of the Spanish Civil War taken by pioneers of photojournalism Robert Capa, David 'Chim' Seymour, and Gerda Taro.

## LIGHT FADING OF AUTOCHROME COLOR SCREEN DYES UNDER ANOXIC CONDITIONS

*Luisa Casella, Andrew W. Mellon Research Scholar in  
Photograph Conservation, The Metropolitan Museum of Art*

Autochromes are complex photographic objects. Their unique preservation needs have been identified and characterized by past research. The conservation concerns with these objects include the physical fragility of the support and the sensitivity of various components to temperature, relative humidity and light exposure. The latter is greatly damaging to the dyes present in the color screen. The poor lightfastness of the dyes has led the majority of cultural institutions to have a policy of not displaying original autochrome plates.

Current research at The Metropolitan Museum of Art aimed at investigating the potential benefits of using anoxic conditions for the safe display of autochromes. The methodology used in the experiment was presented during the 2008 PMG Winter Meeting at the Center for Creative Photography in Tucson, AZ. The current paper presents the results of the experiment. The project tested the six dyes present in the autochrome color screen. Test samples were prepared of each of the dyes. The anoxic setup was achieved by using sealed glass tubes. One group of samples was purged with argon; a second group was sealed under atmospheric oxygen conditions. The samples were exposed to light in a fading unit at the Image Permanence Institute in Rochester, NY. Spectrophotometric data was collected before and after light fading.

The results show that the fading rate of all of the dyes is lower under anoxic conditions. This experiment contributes information that is applicable to other cultural objects that include these same dyes in their composition.

## CLEANING BEVERAGES OFF PHOTOGRAPHS

*Pilar Hernandez Romero, Photograph Conservator, Ottawa  
Museum Network; Lara Kreuzburg; and Marsha Sirven,  
Photograph Conservator, Atelier de Restauration et de  
Conservation de Photographies de la Ville de Paris (ARCP)*

The idea of this study started after an incident during the opening of an exhibition of big format silver gelatin prints in a museum in Paris. During the opening someone threw liquid all over the photograph hanging into the wall without any protection.

The *Atelier de Restauration et de Conservation de Photographies de la ville de Paris (ARCP)* was asked for its advice. The photograph was examined with raking light; where the liquid was projected it had a more matte aspect; the drops at the end of the draining were yellow with a viscous appearance. A solubility test was done under the hypothesis that the liquid was a drink given under the opening. The solubility tests were done with multiple solvents, in liquid and gel form. Finally, it was considered that the results were not as good to treat the entire image.

After the emergency was confronted, it was decided to carry out a test that could bring up a solvent, a treatment and the time to perform the intervention. The test was divided into two parts. The first one was to search the "good" solvent and technique for the cleaning of the beverages. A glass was used to avoid factors as dryness and penetration. The second part pursued to know the consequences of the beverage in the emulsion, to test the cleaning technique of the part one and to determine the time of intervention to have positive results. Several beverages were tested: over a silver-gelatin print in baryta paper.

The final results were acceptable. For most of the beverages, the solvent and technique could remove the residues and not change the emulsion surface and it could be understood what happened in the interaction between the liquid and the gelatin.

## A TECHNICAL STUDY ON THE WORK OF FELICE BEATO IN ASIA

*Sarah Freeman, Assistant Conservator of Photographs, J. Paul  
Getty Museum, and Anne Lacoste, Assistant Curator  
of Photographs, J. Paul Getty Museum*

A technical study of photographs created by Felice Beato, currently in the collection of the J. Paul Getty Museum (JPGM) provided information on medium, printing methods, and light sensitivity. A variety of examination and analytical methods were applied to selected works from Asia. This information will be integrated into the multi-venue exhibition on Beato that opens at the JPGM Center for Photographs in 2011. The exhibition and associated catalog includes Beato's prints, panoramas, and albums from Burma, China, India, Japan, and Korea.

Working throughout the Mediterranean, the Middle East, and Asia during 1855–1890, Felice Beato became known as one of the first photojournalists. Beato supported his career by producing several editions documenting the culture of China and India, and with commissions for the British military. He collaborated with his brother Antonio and James Robertson, becoming a master of the albumen process and the panorama format. Together they captured some of the earliest images of battlegrounds and fallen victims during wartime conflict. Beato documented battles and military expeditions in India, China and Korea for many years, eventually relocating to Japan and Burma where he sporadically maintained commercial studios and an antiques business until his death in 1909.

This study of Felice Beato was achieved through joint efforts with the Department of Photographs at the JPGM, the Getty Conservation Institute (GCI), and the Getty Research Institute (GRI). Dusan Stulik and Art Kaplan from the GCI provided non-destructive analysis using X-ray fluorescence spectroscopy (XRF) and Fourier transform infrared spectroscopy (FTIR). James Druzik and Christel Pesme of the GCI performed microfade testing to determine sensitivity ratings for hand-colored prints. A detailed visual examination of 19th century material from GRI's special collections was conducted with Teresa Mesquit, for comparison.

Photographs (<http://photograph-conservation.blogspot.com>), created as one of the products of this project. Finally, a graphic and textual analysis was produced, which is a synthesis and interpretation of the information obtained through all the interviews.

## CURRENT STATUS OF TREATMENT PRACTICES IN PHOTOGRAPH CONSERVATION

*Alejandra Mendoza, Andrew W. Mellon Fellow, Fifth Cycle,  
Advanced Residency Program in Photograph Conservation*

This research presents an analysis of the current status of treatment practices in photograph conservation, based on the information obtained through fifteen videotaped interviews with senior photograph conservators—thirteen working in the United States and two working in Europe—conducted between the months of January and May 2009. The goal of the project was to understand, document and communicate the ways in which treatments are approached, decided, conducted, and evaluated, both within institutions and in private practice.

Interviews were conducted because they represent a unique research tool that provides special information, otherwise difficult to obtain. An interview can be seen as a conduit of personal judgment, experience, and information.

The interview questions were designed to define and describe current conservation treatment practices and also discuss their transformation over time. Specific treatment topics (like daguerreotype cleaning, chemical intensification, treatment of contemporary photographs, etc.) are addressed during the interviews. Training and future challenges of treatment are discussed briefly.

As a dissemination and access tool, the video interviews and the complete documentation of the research process are available in a blog entitled Conservation Treatment of

## RESEARCH AND TECHNICAL STUDIES

### DEVELOPMENT OF A MICROFADING TESTER FOR LIGHT EXPOSURES INCLUDING NEAR-ULTRAVIOLET WAVELENGTHS

*Chong Tao and Paul M. Whitmore, Art Conservation Research Center, Department of Chemistry, Carnegie Mellon University*

The microfading tester (MFT) is a tool used to characterize the light sensitivity of colored materials encountered in cultural property by performing tiny, sensitive fading tests directly on those objects. Originally aimed at identifying fugitive colorants (ISO Blue Wool 1 or 2 lightfastness grade) exhibited in indoor environments that are free of ultraviolet radiation, the MFT was designed to deliver high intensities of visible light to the test spot. While the overall performance of the original instrument design has been shown to be reasonably well correlated to other accelerated light exposures, the device has since been modified by various users to address some known shortcomings of the simple optical system, such as chromatic aberrations that slightly distort the wavelength spectrum delivered to the test area. Those improvements have generally led to very small changes in the instrument performance.

Over time, users have begun to explore whether the MFT can be used to answer other questions about light sensitivity of artifact materials. Of particular interest is the characterization of the fading of more stable colorants (ISO Blue Wool 3 and greater), which tend to fade primarily from exposure to ultraviolet wavelengths. In this paper we report the modification of an MFT to deliver controlled intensities of light from near-UV wavelengths through the visible spectrum. New components and modified techniques to operate the instrument to optimize delivery of the desired wavelength spectrum are explored. The performance of the new instrument to measure the fading of materials having lightfastness of ISO Blue Wool 3 and greater will be presented.

### PERFORMANCE COMPARISON OF FOUR MICROFADING TESTER DESIGNS

*James Druzik and Christel Pesme, Getty Conservation Institute*

A lab book entry dated September 21, 1994 documents an idea for a microfading instrument (MFT) that could determine the presence of highly light-sensitive colorants on works of art in a “virtually” non-destructive manner. That instrument saw “first light” two years later and was published by Paul Whitmore in JAIC 38:3. Today, more than a dozen microfading testers have been built mostly in line with Whitmore’s architecture using that original article as a blueprint. Since the instrument is built from off-the-shelf components supplied by Newport Corporation there were bound to be hardware modifications as users sought to make improvements or adapt the concept to different performance goals. Those changes are of three main types: (1) Replacement

of the simple lenses in the probe with duplex achromats to limit chromatic aberration in the focusing spot, (2) replacement of the probe lenses and the 0/45 ° measurement geometry with a diffuse reflectance near-surface contact probe, and (3) substitution of the separate power supply, digital controller, lamp housing, and filter assembly with a single integrated light source/power supply/filter holder more conducive to portability.

Given the off-the-shelf nature of the MFT and the lack of established protocols for use, its proper application and the comparability between existing instruments resides in the experience of the users and the robust nature of the original concept. Holding the user variable constant, we tested the latter by building four instruments and comparing their results on a set of 18 colorants. This set, in addition to the first three ISO Blue Wools, included watercolors and gouaches, faded and unfaded construction papers, soft pastels made by Weber, Le Franc, and Mengs from the studio of Georgia O’Keeffe, and three samples each, dyed textiles from early 20th century sample books from Agfa-Griescheum and J.R. Geigy. The four instruments were held within the range of 600–900 millilumens and the ISO Blue Wools were used as internal standards. Assignment to the light-sensitivity categories currently used in risk management by Michalski, Brokerhof and others were made based on the relationships between sample fading curves and internal standards. The results will be described in detail along with the implications for new users.

### INFORMING DECISIONS FOR THE PRESERVATION OF LIGHT-SENSITIVE MATERIALS: A PRACTICAL USE OF THE MICROFADE TESTER WITH WATERCOLORS BY GEORGIA O’KEEFFE

*Dale Kronkright, Georgia O’Keeffe Museum; James Druzik, Karen Trentelman, Michel Bouchard, Catherine Schmidt, and Christel Pesme, Getty Conservation Institute*

For its collection of 125 watercolors and pastels, the Georgia O’Keeffe Museum (GOKM) hopes to establish precise, replicable data about the light sensitivity of each color in each work, in order to estimate the length of time (in lux-hours) before these sensitive colors first begin to appear noticeably different (faded, darkened, or color-shifted). GOKM staff designed a scientifically defensible exhibition management plan for eleven watercolors in the collection, experimentally pushing the preservation target—the point of “just noticeable difference”—in each work to a 120-year time frame using microfadeometry and Raman and XRF spectroscopy data from the Getty Conservation Institute (GCI). This presentation will illustrate how exhibition management plans were developed and implemented for the eleven watercolors, using the GCI analyses as a starting point.

## MICROFADE TESTING OF 19TH CENTURY IRON GALL INKS

*S. Tse, Canadian Conservation Institute, and D. S. Guild, Canadian Conservation Institute, Dept. Canadian Heritage; V. Orlandini, National Park Service; M. Trojan-Bedynski, Library and Archives Canada, Gatineau Preservation Centre*

Since December 2007, the Canadian Conservation Institute has been using the Oriel Microfade Tester (O-MFT) for direct determination of light sensitive materials. The technique, developed by Paul Whitmore at the Art Conservation Research Center at Carnegie Mellon University, involves shining a very small, very high intensity UV-free light spot directly on an object, recording its visible spectra and at the same time measuring any color change that may occur during light exposure.

Among the historic colorants and media tested using the O-MFT, light color or partially faded iron gall inks were found to be among the most fugitive (ISO BW 1-3). Fading of light colour inks is a concern for Canadian archives and museums, as the iron gall inks found in many Canadian historic documents suffer from ink fading rather than ink corrosion. In order to better understand the effect of light exposure on original inks, and to determine exhibition protocols, microfade testing was carried out on five sets of original inks before and after eight separate aqueous treatments, and after previous light exposure. These samples are part of an ongoing study evaluating the effect of aqueous treatments on iron gall inks. This paper will describe the results of ink microfading tests, and how the data can be used for determining exhibition policy.

## EXHIBITION LIGHTING DECISIONS AND MICRO-FADING AT THE NATIONAL MUSEUM OF AUSTRALIA

*Bruce Ford, Consultant, National Museum of Australia*

In late 2007 the National Museum of Australia, concerned about the resources involved, undertook a review of its exhibition lighting guidelines. At an estimated average cost of \$1000 per light-driven object replacement, they were costing the museum several hundred thousand dollars a year. Two factors in particular emerged as responsible for the high level of replacements: the first, a lack of reliable fading-rate data which led not only to an excessively cautious exposure regimen on average, but also over-exposure of very fugitive materials not identified as such; the second, an assumption that all objects are equally likely to be displayed over time.

To address the first problem, in early 2008 we purchased a Newport Oriel Fading Test System, since when we have made minor modifications and developed methods that have allowed us to apply it to most of the enormous range of different materials and objects found in a general social history and ethnographic collection. It has proved to be a highly cost-effective means of separating out those materials

at genuine risk of unacceptable fading under museum lighting conditions from the rest, for which exhibition times may, more often than not, be extended.

In parallel with this technical approach, we are “trialing” a risk-managed lighting framework that gives objects regarded as highly significant to the museum—and, therefore, more likely to be in regular demand for exhibition—the same or less exposure per exhibition period than before, but that allows the majority of less used items more exposure when they are exhibited. We have developed a practical and contextually rich significance assessment process for this purpose which, with the micro-fading data, enables us to identify and concentrate resources on protecting the most vulnerable and most important items in the collection.

## LOOKING OVER THE PAINTER’S SHOULDER

*Joris Dik, Associate Professor, Delft University of Technology;  
Koen Janssens, Professor, University of Antwerp*

Just microns below their paint surface lay a wealth of information on Old Master Paintings. Hidden layers can include the underdrawing, underpainting, or compositional alterations by the artist. All too often artists simply re-used their canvases and painted a new composition on top. Thus, a look *through* the paint layer provides a look *over* the painter’s shoulder. This paper will discuss new directions in non-destructive, subsurface imaging techniques, ranging from X-ray based methods to new techniques like terahertz imaging. Case studies include the work of Rembrandt, Van Gogh, and Philipp Otto Runge.

## THE EFFECT OF METAL IONS ON EARLY STAGES OF CURING IN LINSEED OIL MODELS

*Margaret G. MacDonald, Conservation Science Fellow,  
and Barbara H. Berrie, Senior Conservation Scientist,  
National Gallery of Art*

Investigation of the deterioration processes of traditional artist materials is of fundamental importance to the field of conservation. In this context, oil paintings must be viewed as a dynamic system, in which a complex mixture of inorganic compounds (pigments, driers) and organic binders (oil) interact and react, undergoing chemical and physical changes over time. In order to approach a system as complex as oil paint, this research is simplifying the system through a study of model compounds. This paper will present results from research using model systems designed to mimic pigment and binder interactions.

Ethyl linoleate and glycerol trilinoleate have been shown to be appropriate models for mechanistic studies on linseed and other natural drying oils. This work investigates the mechanism by which linseed oil cures through a study of

ethyl linoleate, glycerol trilinoleate, and linseed oil films curing in the presence of pigments that act as catalysts (such as lead white) or inhibitors (such as red organic lake pigments). The aim of this research is to gain insight into the resulting network structure and long term stability of linseed oil films by identifying the early stages of the curing process.

The action of different metal ions present in common driers has been studied by adding stoichiometric amounts of  $M^{n+}(CH_3COO^-)_n$  [ $M=K^+$ ,  $Co^{2+}$ ,  $Pb^{2+}$ ,  $Zn^{2+}$ , and  $Mn^{2+}$ ] to ethyl linoleate and following the reactions through microscopic and spectroscopic analysis with ATR-FT-IR, UV-Vis, Fluorescence, and NMR spectroscopy, as well as HPLC. Within a month these films are not physically homogeneous. Polarized light microscopy reveals areas with an ordered structure within the film which fluoresce. FT-IR analysis on these ordered areas suggests new species have formed. Ongoing research on the identification of fluorescent species in lead paint will be presented.

## THE TRANSMISSION ELECTRON MICROSCOPE AS A COMPLEMENTARY TECHNIQUE FOR PIGMENT IDENTIFICATION

*Joseph R. Swider, Elaine F. Schumacher, and Joseph G. Barabe, McCrone Associates, Inc.*

Pigments may be identified by a number of distinguishing characteristics, including color, particle size and morphology, elemental composition, presence of trace contaminants and crystalline phase. Characterization of pigment particles and associated materials may provide the key to dating or authenticating a work of art. Information about the source of a pigment or its method of preparation may also be gained through pigment particle analysis, particularly when samples of known origin are available for comparison.

In many cases, polarized light microscopy will be sufficient for identification of a pigment sample. Scanning electron microscopy with energy dispersive X-ray spectrometry (SEM/EDS) provides imaging at higher magnifications, and confirms elemental composition. Bulk or micro X-ray diffraction (XRD) can be used for crystalline phase identification, especially when combined with elemental information obtained by SEM/EDS.

Transmission electron microscopy (TEM) is used less often than these techniques, but may provide identifying information about a pigment that they cannot. The TEM is unique in its ability to probe heterogeneity, morphology, elemental composition and crystal structure, all with extremely high resolution. In addition to its value in identifying multiple components mixed on a very fine scale, the TEM may also be the instrument of choice when a very limited amount of sample material is available, or when dealing with extremely small particle sizes. TEM results complement those obtained using other characterization methods, and may provide the confirmation needed to

unambiguously answer questions about a document or work of art.

Case studies will illustrate the application of optical microscopy, SEM/EDS, XRD, and TEM to a variety of pigment identification problems. These examples will highlight the unique capabilities of the TEM for pigment characterization, and the definitive role that TEM results can play in document and artwork analysis.

## THE IDENTIFICATION OF EARLY EASTERN WOODLANDS QUILLWORK DYES VIA LC-MS WITH A DIFFERENT APPROACH TO SAMPLE COLLECTION

*Christina Cole, AAUW American Fellow, University of Delaware*

Compared to fine art, there are fewer technical studies on ethnographic art, and none on the early quillwork dyes used by Native Americans east of the Mississippi. Consequently, treatment, display, storage, and interpretation decisions of quillwork must be inferred either from generalized best practices, or from larger “western” anthropological studies that generalize quill dye use across all Native American communities. As an organic dye analysis problem, liquid chromatography-mass spectrometry (LC-MS) can address the gap between literature-based evidence of dye use and what is represented within museum collections, but only to the extent that sampling concerns are resolved. Collections care policies may allow for minimally invasive analysis, but analysis of Native American material culture must equally satisfy community expectations for preservation and use. These objects may additionally be subject to the wording and intent of the United States’ Native American Graves Protection and Repatriation Act.

This paper presents the first large-scale analysis of quillwork from multiple collections, for a statistically relevant overview of pre-1865 Eastern Woodlands quill dyes. In accordance with input from Native and non-Native quillworkers, museum professionals, and scholars representing reservation, public, private, non-profit, government, and academic perspectives, a LC-MS based method has been developed to identify as little as 5ng of colorant *without sampling in the usual sense* and without compromising the physical, visual, or mechanical integrity of the analyzed object. Details of sample collection will be presented as well as the parameters for the LC-MS method, based on commercial instrumentation modified for use with ultra performance liquid chromatography (UPLC) column technology. The results of a survey of early Eastern Woodlands quillwork from three major North American museums will be presented, including evidence of a dye not previously reported as ever used on porcupine quills.

## JOINT SESSION: BPG & RATS

### NON-DESTRUCTIVE ANALYSIS OF 14TH - 19TH CENTURY PAPERS

*Tim Barrett, University of Iowa Center for the Book; Mark Ormsby, National Archives and Records Administration; Robert Shannon, Bruker Elemental; Michael Schilling, Getty Conservation Institute; Joy Mazurek, Getty Conservation Institute; Jennifer Wade, Library of Congress, Preservation Research and Testing; Irene Brückle, State Academy of Art and Design, Stuttgart, Germany; Joseph Lang, University of Iowa; Jessica White, University of Iowa Center for the Book*

The William Barrow Laboratory's pioneering 1974 analysis of 1,470 historical papers from the 16th through 20th centuries demonstrated that early, well-preserved papers were made from pure cellulose (rags), were neutral or slightly alkaline in pH, and contained an alkaline reserve (likely calcium carbonate). Because the Barrow work was based on destructive tests, exceptionally stable 15th century papers were not included in the study due to their rarity and value.

With funding from the IMLS, the University of Iowa, and the Kress Foundation, and with support from a number of collaborating institutions, in the Fall of 2009 we completed a two-year study of 1,580 primarily European papers using non-destructive methods. Book, manuscript, and printmaking papers made between the 14th and the 19th centuries were tested using XRF and UV-Vis-NIR instrumentation. For each specimen, we gathered data on 15 chemical or physical variables as well as publication information (date, title, author, country, etc.). The data show that the 15th century papers tested were thicker and had higher gelatin and calcium concentrations compared with papers made in subsequent centuries. Preliminary results also indicate that lighter color was generally associated with higher levels of gelatin and calcium, and overall superior materials and workmanship.

In two related experiments, we are investigating the ability of non-destructive XRF, UV-Vis-NIR, and ultrasonic methods to predict changes in the concentrations of Ca, Fe, alum, and strength in historical papers as a result of typical aqueous conservation treatments.

All research methods and results of the study will be published as an interactive website in 2010. Research results are expected to be of interest to conservators, paper historians, and those who manufacture modern archival papers. The data will also serve as a key reference for any future accelerated aging studies designed to investigate the causes of paper aging.

### THE ROLE OF ELECTROPHILIC METAL IONS ALUMINUM(III) AND MAGNESIUM(II) IN PAPER DEGRADATION AND DEACIDIFICATION

*John W. Baty, Andrew W. Mellon Postdoctoral Fellow, William Minter, Senior Project Conservator, and Sa Yong Lee, Andrew W. Mellon Postdoctoral Fellow, Department of Conservation and Preservation, Sheridan Libraries, Johns Hopkins University*

While the oxidative degradation of cellulose in paper has been readily acknowledged to be complex, with different pathways favored over others depending on the oxidizing agent and the presence of light and catalysts, discussion of cellulose *hydrolysis* in paper, by contrast, has been virtually confined to a single proton-catalyzed mechanism. This is true despite a diversity of glycoside hydrolysis pathways presented in the physicochemical literature. Recent studies using a small carbohydrate to model cellulose suggested that the aluminum(III) ion, which is introduced to paper in alum-rosin sizing and for many other reasons, can attack the cellulose chain directly as an electrophile rather than just as a source of protons for Brønsted-acid catalyzed hydrolysis. These studies further suggested that an electrophilic path may in fact overwhelm the proton-catalyzed path under certain conditions relevant to heritage collections.

Heritage Science for Conservation, a part of the Department of Conservation and Preservation at the Sheridan Libraries of Johns Hopkins University, is drawing on those previous studies and greatly expanding them using actual paper as a substrate, thereby incorporating the periodic crystalline and amorphous regions of cellulose that are retained in paper, as well as the particular way in which water is adsorbed onto paper fibers. This research is measuring the electrophile catalyzed mechanism at an expanded pH range and is looking at the interactions of Al(III) with another electrophilic ion, Mg(II), to clarify the effectiveness of certain deacidification methods to combat this electrophile-catalyzed mechanism of hydrolysis.

Targeting a core paper degradation pathway—the hydrolysis of cellulose—this research aims to deliver high-leverage data to three vital applications: (1) Conservation materials and practice (including deacidification), (2) specifications for modern permanent and durable papers, and (3) the efficacy of accelerated aging procedures to predict the permanence of paper specimens.

## FINDING SUPPORT: REASSESSING & DEVELOPING A NEW SUPPORT SYSTEM FOR ORIGINAL UPHOLSTERY

*Gretchen Guidess, MS candidate, Winterthur/University of Delaware Program in Art Conservation (WUDPAC); William Donnelly, Conservation Assistant, Winterthur Museum & Country Estate; Joy Gardiner, Adjunct Assistant Professor, WUDPAC; Joelle Wickens, Ph.D., Adjunct Assistant Professor, WUDPAC*

A recent conservation treatment performed on a slip seat with surviving original under upholstery provided an opportunity to assess a previous treatment. The slip seat belongs to one of a pair of Federal-era chairs recently purchased by the Winterthur Museum & Country Estate. The previous treatment did not support the under upholstery adequately, and the curator's desire for better visibility of the materials for study precipitated its removal. Other treatment methods that have been used to support upholstery were considered and found inappropriate. A new treatment was devised using a material that had not, to the authors' knowledge, been utilized in this particular area of conservation. The material, Vivak<sup>®</sup> is a water-clear, thermoplastic co-polyester produced by Bayer Material Science Company.

Its chemistry and material properties, which will be described, make it a readily adaptable material for conservation and avoid some of the shortcomings of previously used materials. For the new treatment a custom-shaped support was made and attached to the slip seat frame with a non-intrusive method. It combines virtual transparency with even, full support for the under upholstery that when installed also improved the overall profile of the slip seat.

## NOT MUCH LEFT: DIGITALLY PRINTING REPLACEMENT UPHOLSTERY AS A GROUP EFFORT

*Ann Frisina, Textile Conservator, Minnesota Historical Society*

The James J. Hill House is a grand St. Paul, Minnesota home completed in 1893. A project returning the library, a family gathering spot, to its original presentation was initiated in 2001 by the Minnesota Historical Society. Two wingback chairs belonging to the James J. Hill house are key to interpreting this room. These chairs are no longer in original condition and were sent to the Textile Conservation Lab with several layers of secondary upholstery. Our goal was to return these chairs to their original presentation for use within the library.

Unfortunately, very little physical evidence of the original upholstery remained. Piecing together clues, we had just enough information to confirm that all currently produced upholstery was unsuitable. So how did we go about replacing what was virtually lost? Within this paper I will review the historic research and tacking edge analysis

of the original upholstery covers. This paper will explain the process used to flesh out the design with the aid of a graphic artist and describe how we employed digital printing to emulate jacquard woven upholstery, fitting these chairs into a nineteenth century setting using twenty-first century technology.

## THE USES OF NONWOVEN FABRICS IN CONSERVATION

*Catalina Hernández, Conservator in Private Practice, Bogotá Columbia*

During an archaeological materials conservation project at the Gold Museum in Bogotá, Colombia, the limited budget available to the project compelled conservators to find alternatives to Tyvek<sup>®</sup> and Acid Free Tissue, which are commonly used in the United States and Europe, but are not affordable or available in Colombia and other Latin American countries. Nonwoven Medical Fabrics, such as those used in scrub suits, proved to be safe, efficient, and cost-effective alternatives for these materials, and were readily available from fabric stores in Bogotá. Research was continued at the Textiles Conservation Centre in the UK and at the National Museum of the American Indian in Washington D.C., into the possible uses in conservation and collections care of different types of Nonwoven fabrics, including some used to make car covers, bedding apparel and shopping bags. Several samples were mechanically and chemically tested to be used as protective barriers during treatment of objects and in storage, and as breathable barriers for conservation treatments, such as contact humidification, as alternatives for Gore-Tex<sup>®</sup>. The results up to date have been very positive, where the specific characteristics that make a Nonwoven fabric adequate for use in conservation have been identified, and recommendations on how to commercially find a fabric with these characteristics have been developed for conservators working in parts of the world where common materials are not easily found.

## REVISITING TREATMENT OF 12TH CENTURY MONGOLIAN DEELS

*Allison McCloskey, Assistant Conservator of Objects and Textiles, Williamstown Art Conservation Center; Myagmarsuren Butenj, Conservator of Textiles, Cultural Heritage Center of Mongolia; Matthew Cushman, Assistant Conservator, Paintings and Analytical Science, Williamstown Art Conservation Center; Cynthia Luk, Conservator of Paintings, International Projects Specialist, Williamstown Art Conservation Center*

This paper assesses the conservation treatment of three 12th century deels (traditional Mongolian cloaks) that were unearthed in an archaeological dig by the Center for Cultural Heritage (CCH) of Mongolia. When Allison McCloskey and Cynthia Luk, conservators from the Williamstown Art Conservation Center, Williamstown MA, traveled to

the Mongolian capitol of Ulaanbaatar as part of a bilateral exchange funded by the Trust for Mutual Understanding, New York, an opportunity for further collaboration arose. Conservators at the CCH presented the work that had been performed on the deels to date, and initiated discussion on the merits of the treatments and what next steps would best preserve these rare archaeological textiles.

Conservators from the CCH first immersed the silk deels in an isopropyl alcohol bath to address the heavy soiling and microbial activity. During this bath they were able to separate the individual deels, which had been a single entity when excavated. They followed this immersion with an aqueous cleaning in a solution of commercially available powdered detergent. The garments were dried under glass weights to reduce the creasing and distortions.

Once dry, the deels were stitched to rigid supports with a padded, fabric-covered surface. Narrow, fabric-wrapped piping, approximately 3/16" diameter, was inserted inside all the folded edges of each deel to pad the crease and reduce future damage. The deels were then stitched to the fabric supports, using vertical lines of laid and couched stitches. One deel has nylon net stitched over its surface for additional support.

Conservators at Williamstown have proposed to analyze samples of the deels to determine the present state of deterioration of the silk, if the documented treatments have left behind a measurable amount of harmful residue, and what steps may be undertaken to best preserve them now. One fragment that has been treated with the above-mentioned alcohol and aqueous cleaning will be analyzed, along with two fragments that were not treated. This will allow for valuable comparison in assessing the safety and long-term impact of the treatment on the deels, and help to plan a further course of action. Techniques will include Gas Chromatography – Mass Spectrometry to detect detergent residue, Fourier Transform Infrared Spectroscopy to determine the relative sericin content of the silk, and Scanning Electron Microscopy imaging to observe the protective sericin coating of the silk fibers. Analysis will be performed in the fall of 2009.

This analysis will provide the conservators at the CCH with valuable information about the deels and their present state of condition. With this, the two institutions will develop a treatment plan for the deels to be implemented by the CCH. Any such additional treatment is hoped to be completed by the Spring of 2010.

### **CULTURAL EXCHANGE PROGRAMS: SHARING CONSERVATION INFORMATION IN AZERBAIJAN**

*Patricia Ewer, Textile Objects Conservation, Mound, Minnesota*

Azerbaijan! Where is it? Many who pride themselves with their knowledge of geography have to think twice about it. Azerbaijan has never made it into the Sunday *New York Times* Travel section, and there are only two guidebooks

dating back to 2004. A breakaway region from the former Soviet Union, this country has a long history of textile and carpet traditions.

Azerbaijan is an oil-rich nation on the Caspian Sea and is earnestly trying to recapture its cultural heritage. The Old City of Baku and several historic sites are classified as UNESCO World Heritage Sites. Museum administrators are striving to increase their knowledge of cultural management to provide best practices throughout the country. Issues include serving tourists' needs, maximizing attendance versus collections needs, researching and developing exhibition, caring for collection, and information dissemination. Several professional exchanges have been made through The Fund for Arts and Culture and U.S. Government agencies.

I was invited by The Fund for Arts and Culture's professional exchange program to go to Azerbaijan to share information about the field of textile conservation. I provided a workshop at the Carpet Museum for area museum professionals, met with museology students, and consulted on the outfitting of the new studio workshop under construction at the Carpet Museum. In addition, I toured exhibits and storage areas and met with museum professionals at several other museums. I was invited for a visit to the State Restoration Center for Museum Treasures to meet their conservators.

Research done before my trip with other professionals alerted me to the fact that conservation was done differently in Azerbaijan. I was intrigued and careful to record their methods while not imposing my "Western" concepts on the subject of conservation. My goal was to initiate a dialogue while respecting their methods.

Following the paths of several of my colleagues Julia Brennan and Mika Takami, I was happy to have this opportunity and their valuable advice. This presentation relates my experiences from this journey.

### **CONSERVATION OF A FELT SCULPTURE**

*Erin Eslinger, Intern to Senior Textile Conservator Beth McLaughlin, Midwest Art Conservation Center, Minneapolis, Minnesota*

It is certainly important to keep in mind the original intent of the artist during treatment of an artwork. The artist, Richard Morris, known for his minimalist style in many mediums, intended a 1968 untitled sculpture to change with time and environment in ways that he did not want to control or predict. This approach, he wrote, "...results in forms which were not projected in advance...Chance is accepted and indeterminacy is implied."\*

The sculpture (80" x 142") consists of eight rectangular panels of commercially produced, 100% wool felt. The pieces are layered, one on top of another, each with fourteen matched, evenly spaced, horizontal slits and is displayed in a loose manner, creating a large swag affect. Each panel has two fastened grommets, one in each upper corner, for display. The weight of the felt has created holes, tears, and misshaping

in the areas surrounding these grommets. Over time, the grommets could and did pull free of the sculpture, which then could no longer be displayed. As part of this treatment, only the stress and damage surrounding the grommets were addressed as any other signs of aging or change are in keeping with the intent of the artist. Those areas were reinforced so the piece could continue to be displayed and function as preferred by the owning institution.

The grommets, some of which had previously been replaced, had to be removed to continue treatment and a technique to safely do so was developed. To facilitate stronger support, the tears and misshaping directly surrounding the grommets were also treated. It was found that this could be done with minimal stress using localized humidification and manipulation. Several weights and grades of wool and wool blends were tested to determine suitability as appropriate support material. A needle felting technique was used to attach specifically shaped support material to reinforce the grommet areas. In comparison to other manners of adhering this support, such as adhesives, needle felting is relatively non-invasive and reversible. The added support was also designed to allow the piece to continue to drape in a natural fashion.

\*Morris, Robert, "Anti-Form", *Artforum* 6 (April 1968): 33-35.

### THE CONSERVATION OF THREE HAWAIIAN AHU'ULA

*Beth Nunan, Object conservator, Staatsburg, New York; Aimée Ducey-Gessner, Object Conservator, Frankfurt, Germany*

Feather capes and cloaks of the *ali'i* (chiefly class) communicate the history of the Hawaiian people through their presence in museum collections around the world. The collection of thirteen of these textile garments at the Bernice Pauahi Bishop Museum attests to the legacy of the museum's founders: the desire of the descendants of the *ali'i* to preserve their heritage so that future generations may continue to learn about Native Hawaiian culture, its history and values. As such, the *ahu'ula* are central to the narratives describing that history and serve as signifiers of its values. From the life of the original owner, to later use as a trade item during the colonial period, each cloak or cape has its own biography that serves as a metaphor for the parallel history lived by Hawaiian people. From the study of their materials (feathers and cordage) and the stabilization of damages, to the preparation of non-destructive and culturally appropriate mounting techniques, conservation plays a key role in ensuring that the garments are accessible to the public and remain legible archetypes of a living culture.

### THE NEW YORK STATE BATTLE FLAG PRESERVATION PROJECT— 10 YEARS LATER

*Sarah C. Stevens, Associate Textile Conservator, Peebles Island Resource Center, New York State Parks, Recreation and Historic Preservation, Waterford, NY*

The New York State Battle Flag Preservation Project's conservator and curator have been conserving and interpreting flags for ten years. To date, 500 flags have been conserved, giving ample opportunity to assess previous restoration campaigns and revisit treatments carried out in the last ten years.

Some of the flags in the collection were restored in the 1960s to celebrate the centennial of the Civil War. Many had a netting treatment applied and a handful were laminated.

The Project's conservator and curator have generally taken a minimally interventive approach to the flags, working towards stabilizing all of the over 1,950 flags in the collection. This approach has led to a somewhat standardized treatment protocol. Over the course of the Project, some of the treatment steps have been refined, as the conservator has become more familiar with the collection and learned of different conservation materials and techniques. Additional analysis done on some of the flags has also led to treatment refinements. On occasion, the conservator and curator decide that a flag needs additional treatment, usually because of its condition. The additional treatments have also been modified over the years. This paper will discuss the benefits and drawbacks of the 1960's treatments. It will describe the decision-making process for the current treatments and evaluate the success (and failure) of the current conservation treatments.

### COMPARATIVE APPROACHES IN TEXTILE CONSERVATION: THE WHALLEY ABBEY VESTMENTS AND THE WHALLEY ABBEY ORPHREYS

*Leanne C. Tonkin, ICON/HLF (Institute of Conservation/Heritage Lottery Fund) Conservation Intern at The People's History Museum, Manchester, U.K.*

The overall aim of this paper is to summarize the outcomes of how and why there were differences in the conservation treatment of a related set of ecclesiastical textiles which were conserved at different times. The Whalley Abbey vestments are known to be one of only two surviving sets of pre-Reformation High Mass vestments which were conserved in the U.K. in the 1980s and early 1990s. The Whalley Abbey orphreys are associated with the vestments and were not considered for treatment until 2009 due to their significance being increased during a collections survey. Towneley Hall Museum and Art Gallery, Burnley Borough Council, Lancashire, the custodians of the orphreys, acknowledged they were not stable enough to go on display

and were in need of conservation work. The orphreys were conserved as part fulfillment of the author's MA studies at the Textile Conservation Centre, formerly of the University of Southampton, U.K. The clear differences in the levels of interventive conservation between the vestments and the orphreys demonstrate an interesting development in the conservation of textiles.

Analyzing the treatment of the Whalley Abbey vestments and comparing these approaches to the issues surrounding the conservation of the Whalley Abbey orphreys, some twenty years later, raised an important awareness of the developing demands of the viewer and the developing ethics of the textile conservator. The final treatment of the orphreys sought to 'value' all elements as significant parts of the altar frontal, thus preserving the evidence of its previous use as well as its future role as a textile artifact. At the same time the treatment also took into account the previous conservation work that was completed on the other vestments to maintain aesthetic continuity whilst on display at Towneley Hall.

### THE EFFECTS OF LONG-TERM DISPLAY ON PREVIOUS TREATMENTS

*Abby Zoldowski, Assistant Textile Conservator, Peebles Island Resource Center, New York State Parks, Recreation and Historic Preservation, Waterford, NY*

In 2009 two early 19th century trapunto bedcovers from Schuyler Mansion State Historic Site in Albany, NY, were removed from display for a long overdue treatment and "rest." This gave the textile conservators a chance to revisit the past treatments performed on the bedcovers and to determine how well they withstood long display.

Both bedcovers had been wet-cleaned at Peebles Island in 1976. After wet-cleaning, both were returned to the site for display with the concern that they needed to be taken off display in order to preserve the quality of the pieces. One bedcover returned to Peebles island in 1982, where it was again wet-cleaned, then given a complete crêpeline overlay and returned to display. The second bedcover was treated again in 1990 with wet-cleaning and local Stabiltex® overlays and returned to display. Both bedcovers then remained on display, albeit in fairly dark historic house room settings, until 2009.

This paper will discuss what effects the long term display had on the bedcovers and on the previous (1982 and 1990) treatments. The bedcover that received the complete crêpeline overlay will be compared to the bedcover with the localized overlays.

### EVALUATION OF COSTUME SUPPORTING FORMS FOR MAJOR EXHIBITIONS: GEORGE WASHINGTON, BENJAMIN FRANKLIN, ABRAHAM LINCOLN, AND FIRST LADIES

*Sunae Park Evans, Senior Costume Conservator, Smithsonian Institution, National Museum of American History, Washington, D.C.*

This presentation discusses the history of the supporting forms that were used for displaying the museum's iconic costume objects. These objects have been displayed several different times over approximately 100 years at the Smithsonian Institution, since the public always expects to look at them at the National Museum of American History, Behring Center. While it is likely that past supporting materials and methods were up to the standards of each previous time period, in retrospect we can now see problems that arose from some of these mountings. Although the overall object conditions are fairly sound, several are distorted and worn, and some seams are stressed due to improper support over many years. As many of these costumes continue on constant display, the best way to prevent further damage is to support them with inert materials in a controlled environment, while correctly interpreting the period body postures and mannerisms. Our new support form is constructed of Ethafoam (Polyethylene foam 220 density) with an aluminum or steel support rod. Some of the merits of our new form are that it is lightweight, inert, and easy to size and handle. Therefore, by analyzing the stress and strain factors of the objects on a correct body shape, by conducting material analysis, and through a better understanding as to how it would have been worn, it is possible to create a new form that provides proper support for many years without causing more damage.

## WOODEN ARTIFACTS

### THE 1855 RESTORATION OF A 16TH CENTURY FRENCH *DRESSOIR*

*Joseph Godla, Conservator, The Frick Collection*

A craftsman working in Marseille, France, in 1855 left a trade card and a note attached to a 16th century French walnut *Dressoir*, now at The Frick Collection in New York. The note briefly describes the condition in which the object was found, mentions the name of the restorer, Frédéric Aupetitlot, *menuisier-ébéniste* in Marseille, and the fact that the piece was 350 years old at the time of the restoration. While the estimate of age may have been overly generous by approximately 60 years, the document serves as a rare record of an early treatment to an important example of French furniture from the late Renaissance.

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

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

### THE TREATMENT OF A CARVED AND PAINTED BUFFET BY PAUL GAUGUIN AND EMILE BERNARD

*Julie Simek, Associate Paintings Conservator,  
Kuniej Berry Associates*

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

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

### SURVIVAL OF THE GREAT FIRE OF LONDON: SIR PAUL PINDAR'S HOUSE FAÇADE OF 1600 – CONSERVATION AND RE-DISPLAY

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

The façade of the two story house was built in approximately 1600 and originally part of Sir Paul Pindar's house on Bishopsgate, London. This exquisite piece of early architectural woodwork is one of only a few wooden buildings to have survived the Great Fire in 1666. It had been on display at the Victoria and Albert Museum for nearly 100 years. In 2006, it was dismantled into its individual structural components in preparation for re-display in the new Medieval and Renaissance galleries, open to the public in November 2009. Before conservation a comprehensive survey recorded the original structure, pegs, metal fittings, and assembly marks. It also identified replacement parts and remains of paint. Built of oak, the façade is constructed of timber frames with mortise and tenon joints. The outer panels are decorated with carved scrolled strapwork whereas the panel-and-frame work on the inside is plain. Detailed technical drawings of joints were made to illustrate the basic construction. The proposed display was designed to incorporate a supportive

steel structure at each floor level replacing 19th century additions. Therefore, the conservation treatment concentrated on stabilizing the individual parts. Once dismantled, the house front components underwent a condition assessment for the first time and subsequent conservation treatment. The damage types included severely weathered and degraded wood, heavy soiling and loss of joint components. This paper will concentrate on the approach chosen for loss compensation. Since losses at joints gave access to construction and manufacturing details of tenons and mortises that are usually hidden the premise for replacements was to keep the original joints accessible. While replacements are traditionally glued to the original, in this case they were designed to be non-intrusive and physically detachable where possible. Oak strips were shaped to fit the area of loss in layers. Additionally epoxy putty was used with a barrier layer between the new and the original wood to help achieve a flush finish. Replacement wood was not inpainted to distinguish between original material and conservation addition. A time lapse camera will document the installation work.

### **A CONSERVATION COLLABORATION: THE JAMES MONROE GILDED CEREMONIAL ARMCHAIR**

*Rick Vogt, Conservator, F. G. Vogt Company*

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

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

The conservation of a gilded ceremonial armchair, owned by the James Monroe Museum and Law Library in Fredericksburg, Virginia, demonstrates how various professionals worked together to bring the project to a successful completion. These individuals included a lead conservator overseeing and organizing the project and

providing the frame conservation, an upholstery conservator, a gilding conservator, surface and material analysts, along with information provided by numerous historians and curators. While somewhat small in scope, lessons in organization, teamwork, communication and information gathering can be drawn from this experience that can be applied larger projects involving more complex objects, an entire collection, or museum interior.

### **JOHN KJELLAND, AQUAZOL, LOUISE NEVELSON, BICYCLES, THE ADAMS FAMILY, AND ME**

*Helen Alten, Director, Northern States Conservation Center*

When Pepsi Syrup exploded over a Louise Nevelson sculpture during a reception, John Kjelland and I were working on furniture for the Adams House Museum in Deadwood, South Dakota. The call came into the Northern States Conservation Center lab and John insisted we drop everything and rescue the Louise Nevelson. We transported the sculpture to the lab and analyzed potential cleaning solutions that wouldn't disturb Nevelson's fragile paint layer. We had been laying down paint on the Adams House furniture using Aquazol and bicycle inner tube strips. We were able to use part of that technique to lay down the flakes on the Nevelson sculpture. The best cleaning solution was aqueous, but the paint was too fragile for swabs. We had been experimenting with PVA sponges for wet cleaning surfaces that traditionally could not be wet cleaned. It worked well on the Nevelson sculpture with modifications to create sponges that allowed for maximum control of the cleaning solution. On the Adams family furniture, the combination of a furniture conservator's approach and an objects conservator's approach led us both to try new materials and techniques for a significantly better result than either of us would have achieved individually.

The treatments were analyzed using the QX3 portable microscope. John Kjelland died late in 2008. This paper is to honor his contribution to conservation and the time we spent together tackling problems new to both of us and teaching each other our personal tricks. He was extremely proud of having worked on a Louise Nevelson sculpture and featured it on his website and resume.

### **AN EVALUATION OF TREATMENTS FOR WATERLOGGED LIGNUM VITAE SHEAVES**

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

Over sixteen lignum vitae sheaves were recovered from the USS *Monitor* wreck site, some of which were found inside the iconic revolving gun turret. Having been submerged in the Atlantic Ocean since 1862, this collection gave conservators a chance to evaluate commonly used

waterlogged wood treatments for one of the hardest natural woods. Each sheave was thoroughly documented, then subjected to one of the following treatments: air drying, polyethylene glycol (PEG) and freeze drying, PEG and air drying, acetone-rosin, lactitol-trehalose, and sucrose. Results of the experiment reveal that air drying is the most successful treatment for waterlogged *lignum vitae*.

## CONSTRUCTING TIME: THE NEUROAESTHETICS OF ART AS EXPERIENCE

*Peter Muldoon, Conservator, Smithsonian Castle*

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

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

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

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

## CHANGING REQUIREMENTS FOR THE MUSEUM ENVIRONMENT: *BALDACHIN ALTAR FOR THE HOLY TRINITY*

*Aránzazu Hopkins Barriga, Restorer,  
National Museum of Anthropology, Mexico*

Even the most well-preserved museum objects cannot escape climate effects. Museum professionals are challenged to improve these conditions, and that involves financial decisions on how to carry out a program suited to their needs. The more important matter is to lessen climate impact, which causes degradation in exhibition objects. Due to this important theme, it is crucial to develop guidance that can be used by museum employees, specifying preventive conservation items.

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

The *Baldachin Altar* is composed of a head wall, a four-column baldachin, cupola, and crucifix. It was created in Olinalá (Guerrero), where Nahua society lives until today. This city has been a center of lacquer objects production since the pre-hispanic era.

In the 19th century, furniture developed in Mexico used decorations from European models presenting oriental subject-matter. These stylistic models were transformed in a novel variety of ways, now part of the indigenous Nahua culture. The conjugation of both thoughts is part of a syncretism process that happened in this period, causing a new religious conception captured in decorative arts.

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

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

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

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

The restoration process developed iconographic, historic, and scientific research about every structure included in the

altar. After its restoration, it will be exhibited individually for a two-year period and then will be stored in the ethnographic collections deposit.

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

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

## AN EXPERIMENTAL AND PRACTICAL STUDY OF SOME CONSOLIDATION AND COATING MATERIALS FOR WOOD AND WOODEN OBJECTS

*Dr. Hany Hanna Aziz Hanna, Senior Conservator,  
Supreme Council of Antiquities, Egypt*

Some experiments have been done to test consolidation and coatings materials for wood and furniture, including a variety of natural and synthetic materials employed in making and preserving the cultural and artistic objects as furniture from the past and the present, such as shellac, Dammar, Rosin, Paraloid, Poly vinyl acetate, etc., dissolved in different solvents at different concentrations or percentages. The experiments have been applied to different wood species such as teak, sidder, pine and beech.

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

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

At the same time, by isolating the surface with Paraloid, we avoided the sensitivity of shellac to humidity. Because the Paraloid is not in direct contact with the wooden surface, it can be removed mechanically when it is damaged and

becomes brittle or yellowed, without causing harm to the wood.

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

## MAPPING AND PREDICTING THE ACTION OF ORGANIC SOLVENTS ON WOOD: SEARCH FOR A DIMENSION-NEUTRAL EFFECT

*Wendy Baker, Fine Art Conservator, Canadian Conservation Institute; David Grattan, Manager of Conservation Research, Canadian Conservation Institute*

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

## ADHESION COERCION: AN INVESTIGATION INTO POTENTIAL COATINGS FOR PEG TREATED WOOD

*Lauren Paige Isaacs, Owner, Flying Pig Art Conservation*

There has already been a significant amount of information collected in regards to Edward Moulthrop's green wood turning technique using polyethylene glycol (PEG), as well as the consequential adhesion problems associated with his choice of epoxy finishes. While Moulthrop was aware of these problems, he regularly agreed to refinish the failed coatings using virtually the same materials as those implemented at the time of initial production. Edward Moulthrop passed away on September 30, 2003, eliminating any future possibility of refinishing the coatings by the original artist as a treatment option. Given that the delamination problems of Moulthrop's work are now beginning to be documented in both public and private collections, it makes sense to investigate potential conservation solutions to the adhesion problem associated with these popular turnings.

In order to better understand the inherent factors influencing treatment options, mock-ups of PEG impregnated wood, simulating Moulthrop's documented materials and technique, were created and coated with a selection of traditional and synthetic conservation materials, approximating the original gloss of epoxy, in a range of appropriate solvents. The results of this investigation were not as initially predicted, and ultimately served to demonstrate the underlying contingencies affecting long-term adhesion to PEG surfaces such as molecular weight, solubility, surface energy, relative humidity, and reaction kinetics. This paper aims to highlight these fundamental aspects of adhesion, and to offer suggestions for future treatment protocols when faced with delamination of the original epoxy coatings on PEG treated wood.

## AN UPDATE ON USING REPRODUCTION FINISHES AS PREDICATORS

*David Bayne, Furniture Conservator, Peebles Island Resource Center*

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

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

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

## POSTER SESSIONS

### QUANTITATIVE HYPERSPECTRAL IMAGING TECHNIQUE FOR CONDITION ASSESSMENT AND MONITORING OF HISTORICAL DOCUMENTS

*B.J. Aalderink and M.E. Klein, Applied Research Engineers, Art Innovation BV; R. Padoan, Conservator, and G. de Bruin, Head Restoration and Conservation, Nationaal Archief; Th. A. G. Steemers, Director Collection, Nationaal Archief*

Quantitative hyperspectral imaging (QHSI) is a non-destructive remote sensing technique that is capable of detecting small changes of the optical characteristics of material surfaces before they become visible for the human eye. For this reason the Nationaal Archief (National Archives of the Netherlands, The Hague) is conducting an applicability study on the use of QHSI for detecting, measuring, and visualizing optical changes in historical documents caused by aging process and conservation treatments.

Most archival institutions regularly assess the condition of their collections in order to determine their suitability for transport, public exhibition, and access by researchers. This procedure typically includes a detailed visual inspection of the documents by an expert, supplemented by a photographic documentation and, possibly, the application of non-destructive measurement techniques at a few selected locations. However, conventional condition assessments can easily fail to detect subtle changes of the varied materials composing historical documents. There is the risk that small optical changes over large areas or large changes in very small areas are overlooked, not being documented with sufficient precision in previous condition reports. Quantitative hyperspectral imaging is a sensitive technique that allows one to measure and document the characteristics of a very large number of object points simultaneously and with high accuracy. A single measurement with the QHSI instrument "SEPIA," currently in use at the Nationaal Archief, provides 4 million spectral reflectance curves in the wavelength range from 365 to 1100 nm (near-UV, visible and near-infrared), for an area of 125 mm × 125 mm (5" × 5") of the document. The resulting data set, the so-called hyperspectral data cube, consists of 70 spectral images, each containing the calibrated spectral reflectance values measured with a sampling resolution of more than 400 dpi.

This high spatial resolution can be exploited to generate a detailed map of the changes of the document condition between two subsequent measurements, e.g. taken before and after an exhibition. To do so, first mathematical transformations have to be applied to the hyperspectral data cubes of the two measurements to compensate for the unavoidable small differences in document position and shape between the two measurements. Then the differences between two corresponding spectral images from the first and second measurement can be calculated pixel-by-pixel. This difference ideally results in the value 0 for pixels related to specific document areas that have not undergone any optical change. Non-zero pixel values map the occurrence and strength of

optical changes within the document. These can be visualized in grayscale or color-coded images that help the conservator to identify the most critical areas on the document.

By calculating the differences, not only for individual spectral images but for the entire two data cubes, it may be possible to distinguish various degradation effects and provide a detailed statistical description of the spectral changes of the recorded sample. This makes the QHSI technique a valuable tool for an objective assessment of the document condition.

### EVALUATING THE USE OF SOME SELECTED NANO POLYMERS IN THE CONSERVATION OF ARCHAEOLOGICAL CELLULOSIC MATERIALS

*Omar Abdel-Kareem, Associate Professor, Monument Conservation Department, Faculty of Archaeology, Cairo University, and Hanaa Nasr, Associate Professor, Polymer and Pigment Department, Chemical Industry Division, National Research Centre*

Polymers are commonly used in the conservation of archaeological cellulosic materials such as paper, papyrus, cotton, and linen. This study aims to evaluate some selected nano polymers in the conservation of cellulosic materials. Two types of cellulosic materials, linen and papyrus, were treated with different types of nano polymers to evaluate the effect of these polymers on the physical and chemical properties of these materials. Two different types of accelerated aging methods, heat and light, were used in this evaluation. The change of the physical and chemical properties of the untreated and treated cellulosic materials after aging was assessed by different methods. The results showed that all selected polymers improve the properties of treated cellulosic materials. However, the results showed that both treated and untreated cellulosic materials became progressively darker and showed progressive losses in tensile strength after aging by different methods. X-ray powder diffraction results show that the aging of the cellulosic materials slightly decreased crystallite size in the longitudinal dimension, also decreasing the total crystallinity compared to unaged samples. Results obtained by Fourier transform infrared spectroscopy show changes in chemical properties of treated and untreated cellulosic materials after aging by different methods. The results of this study will assist a conservator who seeks information about nano polymers suggested to be used in conservation of cellulosic materials.

## CAPILLARY ELECTROPHORESIS WITH LASER-INDUCED FLUORESCENCE DETECTION FOR THE IDENTIFICATION OF HISTORICALLY IMPORTANT DYES

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Historically important dyes have been used for centuries in painted objects and textiles. They are often classified according to their colors: red dyes (alizarin, purpurin, carmine, henna), yellow dyes (curcumine, crocin and morin), and blue dyes (indigo). Various analytical techniques such as liquid chromatography, uv-visible spectrophotometry, Raman and infrared spectroscopy have been used for identifying different dyes. Often the identification process is seriously compromised if dyes are present as a mixture in paintings. One of the objectives of this research is to examine the feasibility of using capillary electrophoresis for separating and identifying a number of historically important dyes. Capillary electrophoresis has the advantage of being an extremely sensitive technique with low detection limits. Furthermore, the low detection limit allows one to work with very small samples, which minimizes damage to an object. For this work a solid state laser (407 nm) with a maximum output of 10 mW and a 500 mW Ar laser was used (484 and 514 nm). Although most of these dyes absorb light at longer wavelengths, their fluorescence emission is much stronger with shorter excitation wavelengths. Fortunately with the Argon laser, the higher power (500 mW) made it possible to detect these dyes with very high sensitivity. While the separation of these historical dyes worked well under basic condition, the extraction procedure for most of the dyes required acidic conditions (e.g. hydrofluoric or acetic acid). Therefore, the fluorescence and separation properties of dyes were examined under different pH conditions (pH=9, 7, and 3).

## ZEBRA HIDE SLIDE

*Helen Alten, Director, Northern States Conservation Center*

A zebra hide transport, storage, and research mount was constructed from aluminum tubing, Coroplast, Sonotube, Marvelseal, terrycloth, and muslin. Two zebra hides could slide one below the other on V-shaped mounts that were hinged so that they could be flat on an examination table. The hides stayed on the mount during transport and storage in the transport crate. They also remained on the mount when examined by scholars or on display.

## CONSERVATION AND MANAGEMENT IN THE ARCHAEOLOGICAL SITE OF PUEBLITO, PARQUE NACIONAL TAYRONA

*María Paula Alvarez, Co-director, Corporación Proyecto Patrimonio, Colombia*

The archaeological site of Pueblito is located in a 2.2 km area of the Tayrona National Park Biosphere Reserve, Sierra Nevada de Santa Marta, Colombia. Settlement developed there during the IX and XVI centuries, characterized by concentric housing terraces interconnected by stone trails that follow the topography and proximity to water sources. The terraces, retention walls, trails, bridges, stairs, and canals are sophisticated examples of stone architecture and engineering that were abandoned during Spanish conquest and rediscovered by 20th century archaeologists.

Pueblito excavations started in the 1920s. The site was recognized in 1947 by the national government and legal protection was established in 1964 with the creation of Tayrona National Park. In the 1980s and 1990s the settlement was restored and opened to visitors on foot.

The Unidad Administrativa Especial Parques Nacionales Naturales (UAESPNN) manages Pueblito. One park ranger and one indigenous family living in Pueblito control visitor access, maintain archaeological structures, and safeguard the site.

In 2006, the Management Plan of Pueblito (Alvarez et al, 2006) was done under supervision of the national archeological authority (Instituto Colombiano de Antropología e Historia, ICANH), which needs to be integrated into the Management Plan of Tayrona National Park. The plan was an opportunity to clarify restrictions on constructing large infrastructures the regional government wanted to build there. It also provided understanding of institutional operations and established the need for a better planning process.

The current state of the site outlined in the Management Plan describes some of the damaged archaeological structures. By 2007, some areas of structures III and XXIV collapsed. In 2008, a documentation and restoration project for these terraces found support from the Fundación para las Investigaciones arqueológicas Nacionales (FIAN) and conservation was carried out. The conservation process allowed better understanding of prehispanic stone construction and deterioration. Conservation procedures, tools, materials and structural monitoring were described.

For the coming year, Proyecto Patrimonio is looking for funds to continue management and conservation activities in the site, especially at terrace XXIV where a large area had collapsed.

## ALTERNATIVE TREATMENTS FOR DRY FIBER AND FUNGAL ATTACKS ON ANDEAN ETHNOGRAPHIC CLOTHING

*Rosemary Zenker Alzamora, Textile Conservator, National Museum of Peruvian Culture, Peru*

Ethnographic textiles are those that are made by a particular culture or ethnic group using historic techniques. They include clothing, textiles, ceremonial and home accessories, etc. Preserving and understanding the cultural context of a museum object can provide a basis for preventative conservation, which involves constant discipline to prevent all forms of deterioration. The National Museum of Peruvian Culture, in Lima, has a large collection of historic clothing from different Andean regions, including dresses, skirts, vests, hats, and pants from the ancient Inca capitol city of Cusco. Many camelid-fiber objects have had fungal attack due to the humidity of Lima, as well as some problems of dry fibers. The alternative treatment we developed for treating dry fibers involved a non-toxic, organic substance Tara (*Caesalpinia Spinosa*). Added to distilled water vapor containing 5% benzene and 2% ethanol, the solution was applied to dry and brittle fibers and finally dried with filter paper or cotton cloth. For treatment of fungal attack due to prolonged high humidity, leaves of the Muña plant (*Mintostachys mollis* *Mintostachys setosa*) were placed with the affected textile for one week. In more severely affected areas, Muña was added to a 5% benzene and 2% ethanol solution in distilled water and swabbed on the affected areas. Results were that the growth of biological activity stopped. These alternative treatments use materials easily obtained within Peru and they are beneficial because they avoid damaging the ethnographic textiles with strong chemicals. This success motivated us to continue experimenting with alternative means for providing “green” preventive conservation methods for Andean ethnographic clothing.

## THE INTEGRAL CONSERVATION OF THE EGYPTIAN COLLECTION OF THE ETHNOGRAPHIC MUSEUM AMBROSETTI

*Gabriela Ammirati, Ethnographic Museum Ambrosetti*

The Ambrosetti Ethnographic Museum, of the Faculty of Philosophy and Arts at the University of Buenos Aires, has an important archaeological collection (more than 70,000 pieces), which is frequently studied by various researchers. The economic reality of the museum, as it impacts the infrastructure and limits staffing, forces us to generate innovative strategies to meet conservation standards for preservation of the archeological patrimony.

As an example, I will present work we do based on the criterion of “integral conservation” which includes conservation, restoration, and all activities related to collection care and use. I will present the example of preserving the Egyptian collection of sarcophagi of wood, statuettes in stone

and terracotta, embalmed animals, ceramics, and objects made in metal, among others.

Our work includes: historical overview of the collection before accession by the museum; care within the institution; review of research on the collection to date; characterization of the constituent materials of the objects to distinguish, among others, original materials and materials added to over time; characterization of the present deterioration and possible causes; proposals based on different analysis to help us identify problems; proposed treatments as needed; proposals for storage; and recataloguing the entire collection.

Developing a comprehensive conservation plan, starting from the history of the collection and passing through different steps such as characterizing the materials and improving storage up to recataloguing, provides more and better ways to help in the pursuit and realization of strategies for value enhancement of the collection. The “integral conservation” approach makes it possible to focus efforts, maximize our resources, and minimize our limitations.

## TREATMENT OF LICHENS, SALTS, AND FUNGI FOUND ON THE EXTERNAL SURFACES OF ROCK WALLING OF THE CATHEDRAL OF CUSCO, PERU

*Silvia Liliana Saldivar Antunez de Mayolo, Director of Technical Projects Office of the Archbishopric of Cusco*

The Basilica Cathedral of Cusco constitutes one of the most important and relevant extant architectural monuments dating from vice regal times in Peru and South America. Within it are contained innumerable works of art spanning three centuries of Cusco history. The construction of this magnificent building began in the year 1559 and was finished in 1668, having through the course of time undergone several periodic restorations. The most thorough and encompassing of these was carried out in the years 1997–2002, under the auspices of a private institution—the Fundación Telefónica (Telephonic Company). The project undertaken at the time contemplated a very wide ranging and all-inclusive integral restoration effort, both at the architectural as well as the individual artistic level with paintings, sculptures, and retablos. It also included the two immediately adjacent churches of la Sagrada Familia and Triunfo. The Archbishopric of Cusco contributed funds for the restoration of works of art and drainage systems.

## CONTEMPORARY ART, ENVIRONMENTAL CONTROL, AND EXHAUSTIVE DOCUMENTATION ABOUT ART: BUREAUCRACY

*Juliana Assis Nascimento, Museu de Arte  
Contemporânea de Niterói, Brazil*

Work with contemporary art collections often means dealing with unpredictable techniques and unstable materials. Correct environmental controls may delay alterations in materials and monitoring can avoid surprises. Precise written and photographic documentation can help guide conservation decisions. Institutional limitations, such as limited financial resources resulting in inadequate structures and insufficient staff, result in problems for collections and challenges for conservation work.

The more than 1000 piece João Sattamini's collection, of the Museu de Arte Contemporânea de Niterói (MAC), is one of the most representative contemporary Brazilian art collections. It had inadequate storage for a long period before arriving in Niterói in the 1990s. It was a few years before the Museum was able to provide better conditions.

One of the MAC'S Works represents the difficulty of caring for contemporary art collections with few resources. A 1979 oil painting, *Sobre a Arte: BU-RO-CRA-CIA* (About Art: BU-REAU-CRA-CY), by Anna Bella Geiger, suffered alteration of the original background. Currently it looks beige-stained with orange but a 1996 photograph shows that it was white. The conservation team evaluated the alteration, examined other works in the same series, and concluded that the alteration compromised the artist's esthetic project.

The painting is unvarnished and had never been restored. Analysis under magnification and cleaning tests confirmed the alteration occurred in the paint itself, which was made with two incompatible materials that were not completely mixed. Close examination of the 1996 photograph revealed that alteration was then already present but much more discrete than currently. Unfortunately there were no later photographs to document the progress of the alteration. Inadequate storage certainly accelerated a process that was probably inevitable. It was a challenge for the team to precisely analyze the artist's materials and define the intervention.

## THE VICKERS VIMY: NEW TECHNIQUES FOR AN OLD AIRCRAFT

*Elizabeth Beesley, MSc Student in Conservation, Institute  
of Archaeology, University College London, and Ian Miles,  
Objects Conservator, Science Museum, London*

The Science Museum, London, U.K., holds a small but significant collection of historic aircraft. One of these is the Vickers Vimy, the aircraft which in 1919 flew the first non-stop journey across the Atlantic. A unique and important biplane, it is currently on open display and its doped fabric covering is being recurrently damaged by public handling.

At present such damage is repaired in a traditional manner, but the accumulation of patches that this leaves, together with concerns over the stability of the patch material, has led to a reconsideration of this treatment. This work examines the construction and condition of the Vimy's covering and investigates alternative methods for its conservation.

The Vimy is covered with a pigmented and doped fabric; dopes are cellulose-based varnishes which were applied to aircraft covering to waterproof it, enable cleaning, increase strength, and providing a smooth, taut aerofoil. Analysis indicated that the textile covering is linen and the main component of the dope is cellulose acetate. In the 1960s, a layer of off-white paint was added, presumably to conceal the stained and patched surface.

Currently, holes and tears in the Vimy's covering are repaired using the same method that has been used since the aircraft was made: an aircraft linen patch is applied over the hole with dope. This method stems from the traditional approach of restoring museum aircraft using techniques which would be used to keep them airworthy. However, over the years this has resulted in a collection of patches on the lower wings, some of which stand out against the paint; also, holes continue to be made in the fabric. This progression of damage, unsightly appearance, and concerns about continued shrinking of the cellulose butyrate dope used at present led to the reevaluation of the doped patch method.

In searching for techniques that would give a more aesthetically-pleasing finish and utilize stable materials, we turned to leather and paintings conservation. A strong, flexible adhesive and support were required; heat activation was focused on due to the swelling of the linen and cracking of the paint layer caused by solvents. Tears made in a doped, linen-covered frame were used to test several adhesives and supports with the card sandwich method. This uses pieces of card tied with thread either side of the torn fabric to provide pressure to make a good join. Lascaux 498 (dispersion of methyl methacrylate and butylacrylate) with a linen backing was found to give the most satisfactory finish and would also allow retreatment in the traditional manner.

It is hoped that using this method, inpainting the patches, and preventive conservation focused on minimizing damage will help to preserve the material integrity of the object. It also marks a change in approach towards the conservation end of the conservation/restoration continuum, but a potential loss of traditional repair techniques.

## THE CAUSES AND POTENTIAL TREATMENTS OF FERROTYPING ON ACRYLIC PAINTINGS

*Megan Berkey, Paintings Conservation Graduate Student, James Hamm, Professor of Paintings Conservation and Interim Director, and Dr. Gregory Dale Smith, Andrew W. Mellon Assistant Professor of Conservation Science, Art Conservation Department, Buffalo State College*

Ferrotyping, defined as packing materials inadvertently adhering to and imprinting texture on acrylic dispersion paint surfaces, is a common form of damage. Mock-up panels were created and samples of Golden fluid acrylic pours were obtained in order to study and observe changes that occurred following damage. Samples were placed in contact with three common packing materials: bubble wrap, glassine and Tyvek. The intent of this research was to establish different methods of treatment for each type of ferrotyping in order to improve the degree and appearance of damage, whether just superficial surface marring or textural deformation. Various techniques were explored employing solvents as well as attempting to “re-ferrotype” a smooth surface onto the areas of damage using heat. While heat treatments managed to imbed particulates in the surface, the use of a solvent vapor chamber had the most advantageous effects in reversing damage. Subtle nuances of the surface characteristics, such as air bubbles and artifacts of paint applications were all retained and unaltered. Modulated differential scanning calorimetry (MDSC) was carried out on the treated paints in order to determine any changes to the T<sub>g</sub> that occurred based on the various methods of treatment. Solvent retention and plasticized paint were a significant result of treatment using a vapor chamber. Alternatively, different cosmetic treatments, including the use of removable varnishes and acrylic film appliqué, were also studied as an aesthetic approach to minimize the appearance of damage. One year following treatment, the samples were revisited to observe changes to the surface that resulted through natural aging in an ambient environment.

## CONSERVATION OF THE NACO MAMMOTH

*Christina Bisulca, Graduate Student, Department of Materials Science and Engineering, University of Arizona, and Nancy Odegaard, Head of Conservation, Arizona State Museum*

The Naco mammoth remains and associated Clovis spear points were excavated in 1952 by “The Father of Southwest Archaeology,” renowned University of Arizona archaeologist Emil Haury. Precious few remains exist anywhere of the Clovis Paleoindians, and this assemblage is considered one of the most important Clovis kill site finds in the world. These remains, which include the original block lift and additional base support created in the 1950s, at present are highly unstable and the heavy 3 by 3 foot structure is now breaking apart. The bones themselves are exceedingly fragile, and

already have extensive damage from previous transport and exhibit. Additionally, adhesives used in the original lift and for later exhibition are deteriorated and damaging the surface of the bone. Because of the instability of the current exhibition mounts, the remains have not been on exhibit for over 20 years.

The conservation treatment devised had to take into consideration the historic and scientific importance of the specimen in addition to its current preservation and the stability of the original exhibition materials. The precise orientation of the bones in the block lift is an integral aspect in its archaeological interpretation and must be preserved. Any materials or solvents used to stabilize the fragile bones could interfere with future scientific analysis, a consideration becoming increasingly important with advances in the extraction and analysis of biomarkers in paleontology.

The ultimate plan for conservation devised was done in collaboration with geologists, paleontologists, fossil preparators, and archaeologists. The treatment relied heavily upon analysis of the skeletal material to understand the reasons for its extreme fragility, which reflect both its depositional history as well as effects of the materials and methods used in the creation of the original mount.

## USE OF SPECTROSCOPIC AND PETROGRAPHIC TECHNIQUES AND IMAGE ANALYSIS FOR DETERMINATION OF THE TECHNIQUES USED AND CONDITION OF THE ANALCO VIRGIN

*Maria Casas, Master Researcher, Universidad Autonoma de San Luis Potosi, Mexico*

In 1999 there was an earthquake that severely damaged the south tower of the Analco Temple, which is the first indigenous parish in the city of Puebla. During the architectural restoring work, the team found that the tower access areas had been bricked up and the internal stairway was removed. In the interior a fill was found at 2.63 meters high that led to an archeological excavation. Material fragments found included ceramics, leather, human and animal bones and metal, among others, with characteristics of Pre Hispanic burials.

One of the most revealing finds was the painting of a virgin, apparently the one of the Immaculate Conception, painted on a stone slab with a very unique and unknown technique. It was found divided in two, and had some lacerations and missing pieces. The features of the image, the proportion and the color palette, suggested the hand of a European artist, however, it seems to have been made using indigenous techniques. This image of incomparable historical value and context was kept safe without considering the correct conservation methods, and therefore is still deteriorating.

To be able to make a restoration proposal for a cultural asset, deep knowledge about it is essential. All of this is

possible today, thanks to the application of different analytic techniques. In this particular case, the implementation of spectroscopic (FT-IR, SEM-EDS, IR) and petrographic techniques and image analysis made it possible to determine the nature of the constituent materials and the execution methods as well as to evaluate the condition of the painting. These are essential elements necessary to formulate future intervention, conservation and rescue proposals for this peculiar pictorial technique.

## MARK ROTHKO'S EARLY WORKS ON PAPER: A TECHNICAL ANALYSIS OF MODERN MATERIALS

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Primarily known for his abstract colorfield paintings, American artist Mark Rothko (1903–1970) also created hundreds of works of art on paper throughout his career. Many of Rothko's earliest works on paper exhibit his characteristic sense of color harmony but are representational, often depicting women and children or landscapes. One group of these works, likely created between the late 1920s and early 1940s, was carried out in what appears to be water-based poster paint on colored construction paper. During this period Rothko was employed as a children's art teacher, and it appears he may have been inspired by the materials used in his classroom.

The project involved researching the palette Rothko used in these brightly colored works on paper. From the more than sixty such pieces held in the collections of the National Gallery of Art in Washington, D.C., a selection of works was chosen for an in-depth study. The pieces examined represent the wide range of colors Rothko employed in both his media and colored paper supports.

Works on paper such as these are notoriously difficult to analyze: the media is often applied in thin layers, the works themselves are small, and sampling possibilities are often limited. The many modern synthetic pigments present in Rothko's palette provided additional challenges in the analysis of these works. The colorants identified through the use of multi-spectral reflectance and fluorescence imaging, vis-IR fiber optical reflectance spectroscopy, 3-D fluorescence spectroscopy, x-ray fluorescence, and attenuated total reflectance Fourier transform infrared spectrometry include: barium white, vermilion, ultramarine, Prussian blue, chrome green, viridian green, and iron earths such as a brown earth, red earth, and yellow ochre. Modern synthetic pigments found include PY 3, PO 1, and PR 83.

## THE EVOLUTION OF BETTER MANAGEMENT PRACTICES OR HOW TO IMPROVE CLIENT RELATIONS AND TO AVOID LITIGATION

*Patricia Dillon, President, Putnam Art Advisors & Consultants*

Outside of the academic and museum world, most conservators work solo or in small partnerships. Although highly trained in science and/or the arts, these professionals are ill prepared to operate in the rigors of competitive business practices and potential litigation. Successful conservators often work with objects that are valued in the high six or seven figures. Recently, these client-collectors paid even more for the same objects. This makes clients very invested in the piece to be conserved. Sometimes the depth of that monetary investment can obscure any artistic, historical, or aesthetic value to the owner and can make the conservator vulnerable to any misstep, real or perceived, by the owner client. Moreover, conservators working with modern and contemporary objects are challenged by the degradation of previously unknown materials.

This year has seen the closing of some of the most prestigious conservation educational centers around the world. The impact of the closing of these major institutions is multifold. Accordingly, conservators are facing a world with less supporting academic research and with fewer well trained professionals. Presented with increasingly novel challenges in the form of new mediums that are disintegrating in ways that have not been seen before and a client base that has spent more money on pieces than any generation before and are unlikely to recoup that investment in their lifetime, conservators face potential litigation as never before.

How does a conservator ensure good client relations and avoid problems that may lead to litigation? The key to success in any business is to determine when to be the professional you are and when to bring in other professionals allowing them to do what they do best. Don't attempt to act like a lawyer if you are not one. Most small business owners, conservators included, get into trouble in one of the following areas: 1) problematic paperwork; 2) failure to communicate well or at all with clients; or 3) they promise more than they can deliver and/or exaggerate their credentials and expertise.

A review of the paperwork generated by a conservator including advertising materials, initial contact letters, retainer agreements, reports, and any follow up materials produced by their business can reveal a business's most vulnerable aspects. What is necessary to protect the conservator's best interests and what should be avoided? Finally, the legal and ethical guidelines for conservators will be outlined.

Using a framework of solid paperwork, good communication skills and a working knowledge of the framework of legal and ethical guides, the paper will be a tool toward best practices to help conservators protect their own interests.

## TIME DOCUMENTED: INFORMATION AS A CONSERVATION AGENT OF CONTEMPORARY ART

Ana Paula dos Santos, Collection Coordinator,  
Museu de Arte Moderna de São Paulo (MAM-SP)

Concerning artwork, it has already been said that conservation is “a race against time.” Especially in contemporary art, this “time” is a post-modern phenomenon, which can be framed in the “representation crisis.” The main question is about guaranteeing the exhibition of this artwork in the future, both materially and conceptually. This includes the preservation of unconventional materials that are not traditionally found in a museum. Documentation is the main factor in preserving the ideology of a work of art. The primary source of information about a work of art is the artist, but other professionals must also be consulted due to the fact that many contemporary artists collaborate with others that are outside of their area of expertise in the construction of artwork.

The Museu de Arte Moderna de São Paulo (MAM-SP) has some installations in its collection that require new thoughts about the technical procedures for contemporary art, each one for its own peculiar reasons. Through contact with the artist, especially during the first time the artwork was mounted at MAM-SP, both technical and conceptual information were gathered. The information about the specific space requirements for the installation and the replacement of materials according to the space where the exhibition takes place is documented. Some information given by the artist is abstract and conceptual but it is part of the artwork. Obviously, some doubts can appear during the mounting process in other venues because the exhibition spaces are different from the one where the artwork was first mounted and the curator may have a new proposal for installation. At that time, the new configuration must be recorded and kept with the original instructions.

Among MAM-SP artworks with this profile are: *Uma Vista* (2002) by Cássio Vasconcellos, *Picnic* (2000) by Marco Paulo Rolla, and *Transestatal* (2006) by Marcelo Cidade. The first one is a photographic installation which requires millimetric precision, the second one is about the presence of artificial and natural traces, and the third one brings the unusual use of garbage and water inside the exhibition space. For each artwork, a mounting scheme was developed and sent to the artist to be approved.

Contemporary art can be defined as a work in process in many ways. The technical procedures are constantly being evaluated; in other words, the past and the future are on the spot all the time.

## GERALDINE’S SCRAPBOOK OF DRESSES: A CASE STUDY

Anna R. Friedman, Book and Paper Conservation Fellow,  
Winterthur Museum and Country Estate

Geraldine’s Scrapbook of Dresses is a late 19th century blank book which Geraldine’s mother filled with swatches of fabric from the clothing that she made for her daughter. The swatches are accompanied by manuscript annotations referring to when the swatches were used and for what kind of garment, and sometimes the price per yard for the fabric. The pages often include small printed pictures from the Butterick sewing patterns showing the style of the clothing made. The original spine was missing and what was left of the sewing was causing severe damage to the pages. The bulk of the inclusions in the book severely distorted the text block. There are more swatches towards the head of the book than towards the tail, there are more swatches in the front of the book than in the back, and there are more swatches closer to the gutter than the fore edge of the book.

The vast majority of published articles on scrapbooks and albums deal with the myriad problems inherent in mass-produced books designed to be used as scrapbooks or albums. None of those articles address how to treat a scrapbook in a blank-book structure that was never intended to be filled with many layers of added material. Blank books stuffed with ephemera are a fairly common problem in archives, as they do not have the nice, rectangular profile of normal books and are often wedge shaped or deteriorating rapidly due to the instability of their contents.

This paper discusses a repair structure that creates an allowance for all the extra material scraps added to the binding while restoring the book to a sewn codex form. Since the book sections are wildly different in thickness, they need to be sewn in a way that accounts for that variety. Standard all-along sewing patterns would need to be too loose to keep the sections aligned and stable. Loose sewing would allow the sections to slide past each other, possibly damaging the fabric swatches in the book which are currently in good condition. The solution to the problem comes in two parts: First, the sections are each individually sewn with a pamphlet-stitch to a concertina guard. Second, the concertina guard and the sections are sewn to stiff support tapes using a packed-sewing to give each section the proper amount of space in the spine. The support tapes can then be laced into a binding structure or can be hidden behind paste downs in a case binding.

## MOUNT AUBURN CEMETERY: REVISITING THE PAST, INFORMING OUR PRESENT AND FUTURE

*David Gallagher, Chief of Conservation,  
Mount Auburn Cemetery*

Founded in 1831, Mount Auburn Cemetery is a designated National Historic Landmark and is recognized as one of the country's most significant cultural landscapes. The challenges we face are not unique to cemeteries yet our cemetery's context, age, scale, and anticipated longevity can bring into sharpened focus a number of the preservation issues dealt with by all. Our diverse landscape of living, changing horticulture and myriad of built works has the potential to be a laboratory where materials and techniques might be explored and might ultimately inform preservation challenges beyond our gates. Our mission is to honor the dead in a tranquil landscape; simultaneously protecting our heritage. We expect to remain viable for generations to come yet our monuments will decay. In the context of perpetuity, we moderate that decay, embrace the changing landscape and integrate new burial space; all while focused on preserving the overall character of Mount Auburn.

In the past headstones needing to be re-set or repaired with the lot representative unwilling or unable to shoulder the cost, were buried in place. Repairs often used incompatible materials with poor craftsmanship. Horticulture tended to take precedence over monument care. Changing taste as well as a need to decrease costs led to the removal of cast iron fencing and ornate granite curbing. Monuments were washed with detrimental materials and aggressive techniques. Financial constraints dictated preservation decisions.

Presently we do not bury monuments; they are repaired or stored. While employing good conservation practice, we are open to new techniques and materials. Our projects are of limited scale which allows us to monitor different conservation efforts over an extended period of time. Washing is done with less aggressive materials and techniques. A pilot project is underway to streamline the ongoing multi-year survey at Mount Auburn. The use of the Tablet PC Annotation system will be evaluated for its ability to create a visual link between the data in Microsoft Access and the survey area. We are codifying the philosophy and practices including a Statement of Values and Commitments for the Preservation of Structures. Consultants have offered thoughtful and pertinent insights on which we can base future preservation decisions and there is a commitment to increase the size and professionalism of the in-house staff.

We believe that in the future we will be able to revisit and possibly resurrect buried monuments. We will continue to be open to new techniques and materials. Careful planning means we will integrate new commemorative space within the historic fabric while allowing for adaptation as burials and cremation may give way to alternative ways of commemoration. We are committed to Mount Auburn as a center of community programs, education, and advocacy.

We are constantly exploring ways to generate new revenue streams through services and public programs.

We feel we've built a solid foundation to ensure that Mount Auburn Cemetery is viable into the 22nd century.

## FAILURE TO BIND: A RE-EXAMINATION OF THE AGEING OF HOOK AND LOOP FASTENERS

*Joy Gardiner, Textile Conservator/Assistant Director of  
Conservation, Winterthur Museum & Country Estate and  
Winterthur Assistant Professor in Art Conservation, and Joseph  
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University of Delaware in the Winterthur/University  
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Hook and loop fasteners, the most well-known brand being Velcro, have been in production for over 50 years and are widely used by conservators in the mounting of textiles. In the past few years, there have been two incidents at the Winterthur Museum & Country Estate in which window hangings on long term display in the museum's rooms in the house have spontaneously fallen. It was found in both cases that the method of attachment was hook and loop fasteners and the detachment was the result of the failing of these fasteners. Upon examination, the hook side of the fastener was found to be noticeably softer in feel and less able to grab and hold than new material and the loop side was quite grayed. A few past discussions in the conservation literature have mentioned concerns for the long term chemical stability of these fasteners and the need to use brands found to be most inert and stable. This poster will further investigate the chemical causes of degradation as well as explore possible physical interactions attributing to the failure. Also, this will serve as a call to those with objects on long term display with this method of attachment to assess the potential need for careful monitoring and/or periodically scheduled replacement of the fasteners.

## PREVENTIVE CONSERVATION AND PUBLIC PARTICIPATION IN PRESERVING CULTURAL HERITAGE

*William Gamboa, Conservator,  
Casa Museo Quinta de Bolivar, Colombia*

For more than a decade museums have begun to change how they view and interact with a diverse public; museums now want visitors to actively participate in the life of the museum by communicating their experiences and thoughts during their visits.

This new approach to public participation leads visitors to share the significance of their rewarding experiences and aims to have visitors consider the collections as their own.

It is crucial for preventive conservation to take advantage of this new perspective. Most of the time interaction with the

public has been considered a risk to collections but now it can be turned into an opportunity by showing visitors the work of conservation and helping them understand the public's role in preserving collections.

In Colombia there have been diverse opportunities to demonstrate this new approach. Most have been through exhibitions showing the work of conservators and the importance of preserving cultural heritage. These programs are most successful when visitors can interact with conservators. This leads to new kinds of questions and exchanges, often different than initial expectations.

Last year the Independence Museum had an exhibition about the conservation of one of its most representative objects. There was a conservation workshop with microscopes, photographs, and tools and also different conservation exercises. Visitors were invited to participate by asking conservators questions while they were working and were allowed to see the conservation process in detail.

This experience resulted in a public consciousness of the importance of conservation and of the responsibilities of visitors. A public that considers museum collections of cultural heritage as their own helps in preservation. A public committed to preservation is very important to reducing the constant risks faced by cultural heritage materials.

### **CERAMICS AFFECTED BY SALTS: A COMPARATIVE STUDY OF TREATMENT METHODOLOGIES IN CHILE AND AT THE ARIZONA STATE MUSEUM**

*Francisca Gili and Ester Echenique, Conservators,  
Universidad de Chile*

The condition of archaeological ceramics can be affected by cultural use, physical and chemical changes during burial, and the characteristics of the raw materials. Soluble salts are one of the most common causes of damage: with fluctuations in humidity, the migration of these salts within the ceramic can cause extensive damage to the structure and surface of the object.

There are diverse conservation methodologies to treat artifacts affected by salt. The choice of treatment strategy often depends on the specific needs of the object and the institution. Treatment methodologies may include the characterization of salts (soluble and insoluble) as this can provide essential information to the conservator which will determine the intervention process. This intervention can be indirect (i.e. preventive conservation through control of humidity and temperature) or direct such as desalination in water.

Following different experiences in several Chilean institutions and in the United States (Arizona State Museum) a question arises: Are there standardized methodologies for the conservation treatment of ceramics?

From this question, the main goal of this poster is to examine several approaches for the treatment of salt damaged

pottery from representative institutions in Chile and the Arizona State Museum in the United States. The institutions represented all focus primarily on pottery from arid lands with high levels of salts.

By highlighting key aspects of treatment strategies from Chile and the U.S. we wish to create a cross-cultural dialogue between conservators from each country.

### **IN-SITU EVALUATION OF AUTOCHROME LIGHT FASTNESS USING A MICROFADOMETER IN TRANSMISSION MODE**

*Pilar Hernandez-Romero, Conservator (Mexico), Ottawa  
Museum Network, Canada; Martine Gillet and Chantal  
Garnier, Scientists, and Bertrand Lavédrine, Director, Centre de  
Recherche sur la Conservation des Collections, Paris*

Primary achievements in photography are based on research in the natural sciences: initially for black and white photographs and later for a permanent color process. Currently preservation scientists in cultural heritage institutions investigate the stability of photographic materials. Although standards and recommendations for preservation, including for exhibition, have been published many questions remain concerning the risks of exhibition; autochrome plates require special preservation consideration.

This study aims to bring quantitative data of the light sensitivity of the colored grains by nondestructive in-situ measurement and establish a correlation between the light dose (lux hours) and the fading as the resulting data should be useful to preservation decision making regarding the exhibition of autochromes.

A light transmission microscope was specially equipped with an optical fiber carrying very high intensity incident spot of light. Light was transmitted through an autochrome plate, collected through the microscope lens, and conducted to the spectrophotometer with an optical fiber added in the camera output of the microscope. A specific shutter was added in order to select only the light coming out from one starch grain. We tested numerous violet, red, and green starch grains on three autochrome plates.

This work confirmed that autochromes are sensitive to light and their display must be highly controlled to ensure their long-term preservation. It shows also that it is possible to use the microfading test in a transmission mode on a microscope and then to measure the light fastness of tiny samples.

## THE STUDY OF AMATEUR HAND-COLORING KITS FOR 20TH CENTURY PHOTOGRAPHS

*Jonathan L. Hoppe, Senior, Art Conservation Undergraduate Program, University of Delaware*

Since its introduction nearly 170 years ago, people have sought ways to bring color to photography. Because the earliest photographic images were black and white, and the public expressed a strong desire for colored images, both professionals and amateurs have hand colored photographs with oil- and water-based paints and other coloring media since the 1840s. Though the introduction of color photography has rendered the hand coloring of photographs largely obsolete, numerous examples of the process that still survive can tell us much about the times in which they were created. Identifying the pigments and the mediums used to hand color photographs allows conservators and curators to better treat and understand these photographs.

Spectroscopic analyses of oil-based paints found in two photo-oil kits manufactured for use by amateurs by the J. G. Marshall Manufacturing Company were carried out to characterize and identify the components of the paints. Samples of the paints and other materials in the kits were analyzed with x-ray fluorescence, Fourier transform infrared spectrometry, scanning electron microscopy-energy dispersive spectrometry, Raman, and gas chromatography-mass spectrometry. The same paints were then used to color period photographs (ca. 1930–1950) following instructions provided by the manufacturer. Those photographs were examined using the same spectrographic techniques to determine what, if any, information about the paints could be obtained directly from the hand-colored photographs, and if identification of the pigments and/or binding medium could be made with this information.

After deciding which spectroscopic techniques provide the most useful information, period hand-colored photographs colored with unknown media will be analyzed to identify or characterize their pigments and binding media. This research is ongoing and is the basis of a yearlong Honors undergraduate senior thesis project supervised by Dr. Joseph Weber and Jae Gutierrez, in the department of Art Conservation at the University of Delaware.

## THE GYPSUM WINDOWS WITH ENGAGED COLORED GLASSES FROM EGYPT: A CASE STUDY IN CONSERVATION

*Dr. Badawi Ismael, Conservation and Restoration Department Manager, Valley South University, Qena, Egypt; Ahmed Eldomiyaty, Conservator, University of Cairo Graduate Student; and Anton Rajer, Instructor, University of Wisconsin*

For over one thousand years there has been a tradition in Egypt of making window frames from plaster of Paris lime mortars. We call this tradition “Egyptian Gypsum Windows”

after the material used. In addition, because of the long history of glassmaking in Egypt these windows have inserts of colored glass. The windows are found in many locations such as homes, mosques, palaces, and schools. The earliest period for such windows was in the Tolonic period (868–905 AD), but was not decorated with the colored glass. During the Islamic Fatimid period (969–1171 AD) colored glass was introduced, especially in Cairo. The Mameluke Period (1250–1517 AD) saw a flourishing of the arts with large and ornate carvings in gypsum and the use of multi-colored glass. Technological innovations in this period included double sided decorated frames and refinement of decorative designs which is considered the “Golden Age” in gypsum windows.

Later, in the Ottoman the period (1517–1798) gypsum windows became smaller and more refined as architects emphasized smaller structures with greater refinement. The finest examples of such windows are found in an extended architectural balcony called *Mashrabia* in Arabic. These elaborate balcony features are made of wood, and decorated with gypsum windows for light.

Our research has concentrated on examination and treatment of these fragile windows. Physical examination and technical analysis with x-ray diffraction of the plaster provided us with scientific data about the nature of the materials. We made several models to test our theories about the materials used in making the gypsum windows. We found that a combination of gypsum, limestone powder, and small amounts of sand with 1% PVA in water based emulsion improved the properties of the materials. Our research is ongoing in this topic. To date we have treated about 80 windows at the Bayet el Razzaz house, Cairo, from the 15th - 18th centuries, classical Ottoman period. We are also conducting additional research to find traditional craftsmen who may have made or repaired these fragile ancient windows. Our conservation efforts have included stabilization of the frames, glass conservation or replacement of glass when necessary, and an integrated approach with other allied colleagues.

We thank USAID, the American research center, and Dr. Alaa Elhabashi, project manager.

## EXAMINING LEATHER TREATMENTS AND DRESSINGS USING MICROSCOPY

*Sonja Jordan-Mowery, Director of Conservation and Preservation, Principle Investigator, Heritage Science for Conservation, Johns Hopkins University, The Sheridan Libraries, Department of Conservation and Preservation*

Leather is a highly complex material created as a result of tanning skins of animals and its use as a cover material for books dates to the beginning of the codex. The tanning process for leather has changed over the centuries. Prior to 17th century, leather was of a fine quality and lasted very long in contrast to leather produced from the 17th to the 20th century which shows rapid degradation. During the 20th century, conservators responded to poor quality leather by introducing a variety of leather treatments thought to be

beneficial for leather. Many formulations have been used including, potassium lactate to serve as a buffering agent for internal acids, neat's foot oil and lanolin to serve as a lubricant, Klucel-G in ethanol to serve as a consolidant for degraded leather, and Renaissance Wax as a finisher and leather sealant.

While some of these treatments have fallen into disfavor among conservators, others continue to be used for extreme degradation where no other alternatives exist. While conservators can see the effect of treatments intended to correct mechanical failure, they are disadvantaged from seeing and thus understanding the effects or the value of these treatments on the leather structure itself.

From 1980 to 1983, conservation staff at Johns Hopkins identified and recorded several hundred calfskin bindings from the 16th – 20th century for leather treatment. Carolyn Horton's two step treatment of potassium lactate in solution and the U.S. Department of Agriculture's leather dressing formula were systematically applied. During a systematic preservation assessment of this collection, current conservation staff began a qualitative assessment of the treated leathers.

In conjunction with this year's Annual Meeting, this poster presents a series of high magnification images taken with a Zeiss AxioImager of historic and current leather conservation treatments. In addition to the conservator's visual inspection to determine aesthetic and mechanical performance, the Zeiss Axio-imager M1m has the capacity to view samples from reflected bright field, darkfield, differential interference contrast imaging and fluorescence microscopy, thus enabling the conservator to view the both film formation and degree of penetration of surface dressings. Microscopic analysis will provide a comparative means of qualitative assessment of various dressings. Images of these past treatments were compared with images of surface treatments currently used by conservators: Klucel G, SC6000, and Renaissance Wax. Resulting images from the AxioImager M1m will be presented in the Image Gallery of the Andrew W. Mellon Heritage Science for Conservation Project at the Sheridan Libraries, Johns Hopkins University. The image gallery will make this information accessible to conservation professionals and add to the body of literature already available. Access to such an image gallery will provide a valuable resource and enable conservators to better understand conservation practices.

### **STABILIZING A VISION: THE INVESTIGATION AND TREATMENT OF SOUTHWESTERN POTTERY AT THE BARNES FOUNDATION**

*Lara Kaplan, Conservator in Private Practice,  
Lara Kaplan Objects Conservation, LLC*

Among the masterpiece paintings and other works at the Barnes Foundation is a small collection of historic Southwestern Pueblo pottery. Amassed in the early 1930s, this group of 49 vessels contains many significant pieces, and also

provides insights into Dr. Barnes aesthetic vision. In addition, correspondence and purchasing records in the Foundation's archives give a fascinating glimpse into the Native American curio trade at that time.

Left largely undisturbed since being acquired, the pottery had deteriorated and was in need of scholarly investigation and conservation care. The most pressing condition concerns included pervasive mold growth, soluble salt efflorescence, friable surfaces, and old repairs and overpaint that had failed or discolored. A generous grant from The Henry Luce Foundation allowed for the objects to be thoroughly researched, analyzed, examined, and treated.

Though the main purpose of treatment was stabilization, another goal was to return the objects to a closer approximation of how they would have looked when Dr. Barnes acquired them. Past restorations in particular were seen as an important part of the history of the objects and these, along with evidence of pre-collection use, were kept as intact as possible. One of the most interesting—and challenging— aspects of the project was to preserve the old restorations within the context of current conservation practices for Pueblo pottery. This poster will describe the research, analysis, and treatment that allowed both for the preservation of the pottery and Dr. Barnes' vision.

### **STUDY OF AGING BEHAVIORS OF MECHANICAL STRENGTH, OPTICAL PROPERTIES, AND CHEMICAL COMPOSITE OF PAPER THROUGH ACCELERATED AGING BASED ON PAPERMAKERS' SIZING METHODS**

*Sa Yong Lee, Andrew W. Mellon Post-Doctoral Fellow, John Baty, Andrew W. Mellon Post-Doctoral Fellow, and William Minter, Senior Project Conservator, Johns Hopkins University, The Sheridan Libraries, Department of Conservation and Preservation*

The alum-buffered rosin sizing had been used primarily as a papermaker's friend to impart water-resistance to mass-produced paper internally until conservators noted a surprising phenomenon: the paper used in certain books produced in the 1700s seemed to be conditionally much better than the paper used typical books made during the late 1800s and 1900s. This phenomenon was studied by extracting the paper with distilled water and measuring the pH. A strong correlation was found between the extract pH of paper and the loss of paper strength. The alum changed its face from a papermaker's friend to a very acidic guy to make the paper brittle during storage.

Besides internal sizing, it has been used from an ancient time to coat a film of starch or other materials in order to impart water-resistance on the surface of paper. This traditional way has been continuously improved up to today to increase surface strength and resistance to the force of tacky inks in lithographic printing. This method also compensates the strength loss due to the high amount of filler added into

paper during manufacturing.

There are some researchers who reported the relations between the embrittlement of paper and various sizing methods. However, it is hard to find literature which reports the changes of paper properties and performances depending on the combinations of internal and surface sizing methods with various accelerated aging conditions which mimic the real and include the variations of time, temperature, and relative humidity.

The aging behaviors in mechanical strength, opacity, surface topography, surface chemical composition and performances of paper were studied depending on the combinations of internal and surface sizing methods after the deterioration of the sized paper with variations of accelerated aging conditions (time, relative humidity, and temperature). The differences in paper strength, opacity, and performance after treating the aged samples with different types of conservators' sizing methods and different applications were studied. The data acquired from this study provide us the background information to choose the proper one among conservators' sizing and coating methods.

### EXAMINING CONSERVATION TECHNIQUES USING MICROSCOPY: A COMPARISON OF WHEAT STARCH PASTE PREPARATION METHODS

*Crystal Maitland, Paper Conservator,  
Johns Hopkins University Sheridan Libraries*

Paper conservators are very particular about their paste-making methods, each arguing that their method of preparation is the most effective. There are a myriad of variables in preparation. Some choose to pre-soak their starch, others debate the methods of sieving, working, and kneading the paste after it is cooked. Perhaps the most controversial question is about the merits of cooking paste with a cook and stir, a double boiler, or using a microwave oven. Storage methods for paste, whether in the refrigerator, in a syringe, or under water, are equally contested.

This project proposes to prepare paste by numerous recipes and cast each separate batch as a thin film. Using the Zeiss Axio-imager M1m microscope it will be possible to use reflected bright field, dark field, and differential interference contrast imaging and fluorescence microscopy to view the starch film and granule properties as a function of preparation method. This microscopic analysis will provide a comparative means of qualitative, or perhaps even a semi-quantitative assessment of paste preparation and storage methods. An image gallery presented on the web as a part of the Andrew W. Mellon, Heritage Science for Conservation Project at the Sheridan Libraries, Johns Hopkins University will allow this information to be accessible to the conservation profession. Adding to the body of literature, this research can help guide paper conservators in their choice of paste preparation methods.

### NEW APPROACHES IN THE FIELD LABORATORY OF KAMAN-KALEHÖYÜK

*Melissa Mariano, Preventive Conservator; Alice Boccia Paterakis,  
Director of Conservation, Japanese Institute of Anatolian  
Archaeology, Kaman-Kalehöyük Excavation, Turkey; and Colleen  
Healey, Objects Conservator*

At most archaeological sites the summer field season is short-lived but intense. The urgency to complete as much as possible is felt by conservation teams, whose responsibilities over the field season, and over the site's life, continue to increase and expand. Two important tasks which are often the most difficult to finalize before the season expires are the completion of treatments to all finds and the surveying of growing collections in storage. During the 2009 season at the site of Kaman-Kalehöyük in central Turkey, solutions have been found to remedy these issues successfully to benefit both the site's collections and its conservation department.

During her first field season as Conservation Director at Kaman-Kalehöyük, Alice Boccia Paterakis evaluated treatment protocols for metal objects. She found that the standard procedure, a series of lengthy and toxic alkaline sulfite baths and carcinogenic corrosion inhibitors, was not sufficiently effective to continue using in a field lab environment. Paterakis also reviewed results from ongoing research at Kaman-Kalehöyük on anoxic and desiccant microenvironments for metals, using a product called the RP System by Mitsubishi Gas and Chemical Company. The system is non-toxic and easy to use, and metal finds continued to remain stable after 8 years of enclosure.

In the summer of 2009, use of the RP System was instituted as the standard protocol for metal finds after mechanical cleaning, and when objects cannot be treated before the closure of the field lab, they are placed in these microenvironments and kept stable until the following field season. The long-term goal at Kaman-Kalehöyük is to eventually house most of the metals collection held in storage within these microenvironments.

Another yearly assignment for which the site's conservation team is responsible is to survey the metals collection. For the 2009 season, Paterakis assigned preventive conservator Melissa Mariano to take on the survey in addition to many other preventive tasks, including object mounting and environmental monitoring. During the survey, Mariano was able to isolate hundreds of objects showing signs of active corrosion and rehouse them into individual RP System microenvironments, saving some objects from complete decay.

As the Japanese Institute of Anatolian Archaeology at Kaman Kalehöyük expands and begins excavation campaigns on two additional mounds this year, it was crucial to implement modifications to treatment protocols and division of work within the lab during the 2009 season. These changes show forward thinking and the lab's continued commitment to health and safety and preventive measures, preferring simple, safe, and time-effective approaches over standard, grandfathered systems.

## NANOPARTICLE APPLICATION TO ARCHEOLOGICAL CORDAGE

*Molly McGath, Graduate Research Student, Nancy Odegaard, Conservator, Head of Preservation, and Werner Zimmt, Scientist, Arizona State Museum, University of Arizona*

The Arizona State Museum is home to over 22,000 pieces of whole archaeological basketry, textiles and cordage. While whole pieces of archaeological cordage from the Southwest have been preserved, their continued existence is threatened by their inherent fragility. This research addresses the problem of deteriorating cultural objects composed of cellulose. The preservation of these objects is proposed by introducing nanoparticulate calcium hydroxide in hopes that this will serve to neutralize the acid that is causing the break-down of the cellulose. The aim of this research is to evaluate a methodology for stabilization of fragile archaeological textiles, basketry, and heritage objects. This poster reviews the synthesis of the nanoparticulate calcium hydroxide, the creation of an experimental matrix, the evaluation methodology for understanding the kinetics of penetration into various cellulose substrates for various carrier solutions containing nanoparticles of calcium hydroxide, and the evaluation of the effect of the application of these nanoparticles to a fragile cellulose matrix.

## WEAVERS LOOK FOR A WAY TO PRESERVE THEIR HERITAGE

*Hector Meneses, textile Conservator, Museo T extil de Oaxaca, Mexico*

Teotitl an del Valle is a Zapotec community located 28 km from the city of Oaxaca, in southern M xico. Almost everyone in Teotitl an is involved in textile production, and the tradition is often passed on from fathers to sons. In addition to traditional weavings, such as sarapes and rugs, weavers have been exploring ways to diversify their production by creating hand-bags, backpacks, purses, and accessories. The Community Museum of Teotitl an del Valle (MCTV), established in 1993, shows the town's history from pre-Columbian times until now. The textiles on display are mainly sarapes and blankets woven between 1950 and 1970, and have been on permanent display for over sixteen years. The textiles now show a heavy coating of dust, there is some infestation causing rips and holes, and the mounting system has created distortions. In August 2009, the MCTV's Board contacted the Textile Museum of Oaxaca (MTO) to get advice on care, display, and storage of their textiles. The MTO decided to create a joint project with the MCTV. The MTO will assess the condition of the textiles, and their storage and exhibit standards, during an upcoming renovation to the MCTV building. A preventive conservation program for textiles will also be established. The conservation treatments will be co-ordinated with the National School of Conservation, Restoration, and Museum Studies—"Manuel del Castillo

Negrete"—in Mexico City. Conservation students will do internships in Teotitl an, where the community will absorb some expenses such as lodging and meals. The community will also donate some materials needed for treatment.

This collaboration demonstrates how the initiative of the community to preserve their own heritage has been a vital factor in its success. Active participation of the community increases the likelihood of long-term impact on their textiles, even without a full-time conservator on their side.

## RISK-BASED DECISION MAKING FOR COLLECTIONS: THE ICCROM-CCI- ICN COURSE, THE METHOD, AND ASSOCIATED TOOLS

*Stefan Michalski, Senior Conservation Scientist, Canadian Conservation Institute*

Since 2002, ICCROM, the Canadian Conservation Institute (CCI), and the Instituut Collectie Nederland (ICN) have collaborated on the development and delivery of a course entitled Preventive Conservation: Reducing Risks to Collections hosted in Rome (2005), Ottawa (2006), Sibiu (2007), Beijing (2009), and Quito (2009). As a result of sharing the method with mid-career professionals from all regions of the world, as well as incorporating new developments from various risk assessment projects and services pursued independently by each partner, we have refined the risk assessment method used for the course and developed support tools. These include a short manual, a long handbook (currently in draft form), and a database for entering individual risks, carrying out all necessary computations in the background, creating various graphs for comparing risks, and generating reports for clients. The structure of the overall method, and the basic terminology, was based on the Australian and New Zealand standard for Risk Management (RM), which is itself based on a conventional model of the RM process. The model suggests five sequential steps: establish context, identify risks, analyze risks, evaluate risks, and treat risks. There are two ongoing processes: communicate and consult, monitor and review. Three components are used to quantify a collection risk, based on an earlier CCI proposal called the ABC method where A is rate or frequency, B is loss of value to each affected object, and C is fraction of the collection affected. The latter component is now measured in terms of collection value, using the Collection Value Pie, developed during the course by J.L Pedersoli of ICCROM. The focus of CCI's contribution in the last two years has been as lead author of the manual, the handbook, and the database. We are also pursuing development of our own collection assessment service this year, using the method and the support tools.

The risk-based approach is taught not only for the purposes of comprehensive risk assessments, but also as a quantified approach to specific decisions. It can incorporate intangible values as well as the material science of

deterioration. It can incorporate heritage buildings and their components as part of the institution's collections. Course participants universally enjoy the final section of the course when a day long exercise focuses on a specific collection management decision that conventionally can seem an insoluble dilemma. Examples have included a choice between moving abandoned churches to an eco-museum, or leaving them in-situ, a choice between allowing revenue generating parties in a gallery with wall paintings, or risking loss of revenue, a choice between restricting visitor numbers in a vulnerable and recently restored building, or allowing ten times the visitor flow, and ten times the access.

## EVAPORATION OF FATTY ACIDS AND FORMATION OF WHITISH DEPOSITS ON THE INSIDE OF THE GLASS OF MICROCLIMATE FRAMES IN THE MAURITSHUIS: A CASE STUDY IN THE MAURITSHUIS

*Petria Noble, Head of Paintings Conservation,  
and Annelies Van Loon, Paintings Research Scientist,  
Royal Picture Gallery Mauritshuis, The Netherlands*

Since the early 1990s, paintings in the Royal Picture Gallery Mauritshuis (The Hague) have been routinely glazed to prevent damage from vandalism. Panels, and paste-lined paintings, that are deemed fit to travel, are sealed in specially adapted frames to prevent/minimize climate fluctuations, so-called microclimate frames, consisting of a UV safety glass (Schott Microgard Protect) and a polycarbonate backboard (Lexan). The rebate and the backboard are sealed with an aluminium barrier foil. Over the course of many years hazy deposits, often referred to as ghost transferred or mirror images, have been seen to regularly form on the inside of the glass. The deposits are greasy in nature and depending on thickness, are grayish or whitish in appearance and can severely diminish viewing of the art work. Since 2001, hazy deposits have been removed from the glass on more than 200 paintings in the Mauritshuis.

This poster presents a case study regarding whitish deposits that formed on the inside of the glass of the microclimate frame in which Gerrit Dou's *The Young Mother* (1968, Mauritshuis inv. no. 32) was housed. The heaviest deposits, corresponding to dark reddish brown and black areas of the painting, were seen to form over a period of a few months, from March to July 2007, when the picture was hanging on an exterior, southwest-facing wall of the museum. The dark areas of the painting, built up in multiple layers of oil-rich paint containing a high proportion of chalk, in addition to umber, bone black, red ochre and possibly also asphalt are considered to provide a rich source of free fatty acids. Since 1815, the picture has also undergone some 16 documented treatments involving solvents, which may have led to increased mobilisation of the fatty acids in the paint; the dammar varnish on the picture dates to the last treatment of

the painting in 1987.

Fourier transform infrared spectroscopy and energy dispersive x-ray analysis carried out by the Netherlands Institute of Cultural Heritage, Amsterdam, revealed that the deposits consist of a sodium carboxylate, or a mixture of sodium carboxylates, such as sodium palmitate and sodium stearate, indicating an origin from the oil binding medium. Precise monitoring of the climate conditions carried out on the southwest-facing wall by Technical University of Eindhoven from 2004–2006 demonstrated daily temperature fluctuations on this wall between 15.8°C and 30.5°C with a corresponding variation in relative humidity from 31–80%.

It is hypothesized that a temperature gradient developed inside the microclimate frame as a result of contact with the warmed, poorly insulated exterior wall and/or exposure to direct sunlight through the partially open south-facing windows, causing free fatty acids to readily evaporate out of the paint. The deposition of fatty acids on the inside of the glass is considered to undergo a subsequent reaction with the sodium in the glass to form sodium soaps. The evaporation of fatty acids also occurs with unglazed paintings, but without being noticed, and possibly at a faster rate given the larger difference in concentration between the source and the surroundings. The results correspond with earlier published studies regarding ghost or transferred images on the inside of glass and fatty acid deposits found on the surface of paintings. As a result of this case study the Mauritshuis has now taken measures to improve the conditions of the southwest-facing exterior wall in the galleries. The design and construction of the microclimate frame is also being reviewed.

## ENVIRONMENTAL CONTROL IN THE GOLD MUSEUM, COLOMBIA: CHALLENGES IN ITS RENOVATION

*Adriana Isabel Páez Cure, Conservator-Restorer of Cultural Heritage, Museo del Oro-Banco de la República, Colombia*

The Museo del Oro – Banco de la República (Gold Museum – Bank of the Republic of Colombia) houses, conserves, researches, communicates, and exhibits a large and unique collection of Colombian archaeological and ethnographic heritage that, in addition to gold artifacts, includes pottery, shell, bone, stone, wood, fabric, and human mummies. This great diversity of material poses special conservation requirements. Although its name refers to a specific material, the museum exhibitions tell stories about the metalworking societies that lived before the Spaniards arrived in America. They present their social and cultural context and the complexity of the pre-Hispanic metallurgy in aspects such as the history, technology, uses, and symbolism. The museum has identified small collection samples for six regional museums around the country focusing on the diverse pre-Hispanic cultures that flourished in each region. These exhibitions are planned following the cultural dissemination policies of the Museum and the Cultural Management Office of the Banco de la República. The main museum in Bogotá

provides information about the entire country, whereas the five regional branches located in the cities of Armenia, Cartagena, Cali, Pasto, and Santa Marta focus on the regional archaeological information.

In 1998 the museum began an ambitious renovation project of all its branches including the architecture, curatorship, museography, and educational programs. It has been developed in several stages for the Bogotá Museum due to its enormous impact, while regional museums have been renovated one by one allowing a comparative approach to different situations. These plans have had a diverse impact on conservation resulting from architectural and museographical material changes, new archaeological and exhibition approaches that modify spaces, and innovative technologies for displaying and for controlling environmental deterioration. Changes in environmental control have contributed to the collection of large amounts of data and the possibility of monitoring the six museums from one central station with a quick response. Additionally, they have created new challenges such as variations in relative humidity due to combination of new ventilation systems and showcases.

For those reasons, the role of preventive conservation and environmental control in this transformation is reviewed. In this moment of change, the planning of monitoring procedures, the assessment of the environmental factors of damage, and their control in the six museums are very important. Evaluation methodologies, periods of response, and the infrastructure required to do it have been established. It is relevant to mention that Colombia is a tropical country and the museums are located in cities with very diverse climates and the solutions have been developed according to each climatic situation.

### **PROJECT FOR A STORAGE ROOM AND FOR THE TREATMENT OF THE COLLECTION AT THE AFRO-BRAZILIAN MUSEUM OF THE FEDERAL UNIVERSITY OF BAHIA**

*Griselda Pinheiro Klüppel, Architect and Associate Professor, Ana Vitória Mello de Souza Gomes, Architect, Marcelo Bernardo da Cunha, Museologist, Associate Professor, and Maria Emilia Valente Neves, Museologist, Federal University of Bahia, Brazil; Teresa Cristina Toledo de Paula, Textile Conservator, Museu Paulista, São Paulo University; João Carlos da Silveira Dannemann, Architect, Assistant Professor, Federal University of Bahia*

The Afro-Brazilian Museum (Museu Afro-Brasileiro, MAFRO), originated as a cooperative project between Brazil and some African nations with the goal of promoting study of Afro-Brazilian culture.

The collection consists of approximately 1,000 objects of African and African-Brazilian culture. The artifacts, which are made out of iron, wood, clay, straw, feathers, shells, and different types of fabrics, mirror daily life, technological

processes, religious ceremonies, artistic events and include sculptures, masks, pottery ware, ornaments, musical instruments, games and tapestries. Of particular importance is an outstanding set of wooden panels created by the artist Carybé which represent 27 gods (orixás) of the Candomblé pantheon.

About 80% of artifacts, which could not be put on display, were kept in cardboard boxes on steel racks in a warehouse without adequate physical and environmental conditions.

Work on a new storage area was finished in 2009. In addition to architectural changes, a passive environmental control system with mechanical ventilation and a new air cleaning system were installed. Temperature and humidity can be continually monitored and regulated to provide ideal environmental conditions. Collections were classified according to material characteristics, disinfected, restored if necessary, and correctly prepared for storage. A complete inventory, which is accessible through a computerized database, has been created. These improvements benefit all aspects of MAFRO's work.

### **CONTEMPORARY VISIONARY ART ENVIRONMENTS AND THEIR PRESERVATION: A CASE STUDY OF NEK CHAND'S CEMENT ROCK GARDEN IN CHANDIGARH, INDIA**

*Tony Rajer, Art Conservator, Nek Chand Foundation; John Maizels, Author/Editor, Raw Vision Magazine*

Self-taught folk art environments pose special challenges regarding their preservation. Often made of inexpensive materials, recycled from other industrial sites, the environments easily decay and die. This is not the case with Nek Chand's Rock Garden, located in Chandigarh, India. The 25 acre park has nearly 3,000 sculptures made of cement, tiles, glass, and stone. Constructed over a 45 year period, and opened as a public park in 1976, the garden receives nearly 3,500 visitors per day making it the most visited folk art environment in the world, as well as the largest. Maintaining the park and documenting the growth of this extraordinary vision is the intent of the Nek Chand Foundation. Over a ten year period over 100 volunteers from diverse backgrounds, including conservators have been sent to India to work with Nek Chand (b.1924) to document the garden, help conserve it, and enlarge it. This presentation draws upon the rich body of documentary material and highlights the accomplishments and the effort to preserve what many scholars call the "self-taught Taj Mahal of India."

## RESTORATION OF AN HISTORICAL OBJECT

*Catalina Rivera, Textile conservator in private practice, Chile*

The following text describes the restoration of a flag presented in honor of the 1818 Oath of Chilean Independence, which was part of a larger project that included the flag's exhibition and a study of its iconography. The flag, made of light blue, white and red silk satin, has two faces. In the center of each face, there is an oval shield with a painted emblem, made of silk. The object had undergone a prior restoration by Poor Clare nuns in 1975, which ultimately caused wrinkling and distortions in the fabric. More recent damages sustained by the flag included the drying of the fabric, superficial dirt, loss of warp in the red areas, fading, stains, and numerous tears and losses. Each area of the flag received location-specific treatment corresponding to its degree of deterioration. The treatment process consisted of: cleaning; elimination of prior repairs; returning the flag to a flat state; and stabilization. The shields were removed from the flag and treated independently. They were adhered onto crepeline impregnated with Lascaux 360 HV and 498 HV adhesives, and were then attached to a silk support fabric before being re sewn to the flag through their edges. All of the fabrics and threads used in these treatments were custom dyed following testing by the Textile Department of the Museo Histórico Nacional, taking into account factors such as neutrality and stability over time. The conservation of the object improved it aesthetically and structurally. In addition to being a significant challenge in professional terms, given the complexity of the flag's state of conservation, the project required critical judgment skills, interdisciplinary abilities, and teamwork. By preserving part of our country's heritage, we have permitted new generations to appreciate this national symbol and to understand the socio-historical context in which it was made.

## RESEARCH ON ALTERNATIVE USES FOR BOOKKEEPER AT NORTHWESTERN UNIVERSITY LIBRARY

*Susan Russick, Special Collections Conservator, and Andrew Azman, Intern, Northwestern University Library*

Northwestern University Library has been a client of the Bookkeeper non-aqueous deacidification product since 1994. Northwestern still turns to Bookkeeper as a non-aqueous deacidifying agent, but over the past year, the Conservation Lab has conducted a variety of experiments on the secondary uses and side effects of Bookkeeper treatment. This research examined the effects of Bookkeeper on the rate of mold growth, the drying of wet books, and the discoloration and wetting of papers. The small scale of the experiments has led to the observation of a number of intriguing phenomena but few concrete results. Our testing showed that Bookkeeper does effect mold growth, though these

results were inconclusive. In some circumstances, Bookkeeper treated documents had decelerated mold growth while for other samples accelerated mold growth was observed. Using Bookkeeper in a makeshift drying system showed slight drying assistance for wet books, but this system may not be feasible on a larger scale. Bookkeeper treated paper had a dramatically increased rate of wetting and showed increased coloration of tidelines upon drying.

## THE HUNTINGTON MURALS: BREATHING NEW LIFE INTO A FORGOTTEN TREASURE

*Cynthia Schwarz, Kress Fellow in Paintings Conservation, Yale University Art Gallery*

In 1926, Yale University Art Gallery (YUAG) received a gift of over 30 decorative architectural paintings from Collis P. Huntington's palatial home built in 1893 on New York's 5th Avenue. The paintings represent an important collection of early American Mural Movement works. With the renovation of YUAG's Street Hall and a renewed interest in the Mural Movement, the paintings are now being conserved for their installation in the galleries in 2012. Though this project will encompass the conservation of 30 pieces, treatment thus far has focused on nine 40 by 80 inch lunettes by H. Siddons Mowbray (1858-1928). These pieces were hastily detached from the walls and subsequently stored rolled around 2 by 4 inch lumber, resulting in extensive paint losses and structural damages. Though damaged during removal, the untreated paintings were kept in storage for over eighty years. This protected them from the application of surface coatings or other interventions resulting in the surviving surfaces being in pristine condition.

The treatment of this large collection has presented conservators with several unusual challenges, three of which will be outlined in this poster: the removal of adhesive from the versos, the mounting technique onto rigid supports, and the filling and inpainting system. These three steps represent a sampling of the innovative methods developed to deal with this large damaged collection within a tight time schedule.

The versos are coated in the original lead white adhesive used to mount them to the mansion's walls. After examination and extensive testing of many removal systems, a mechanical method for lead paint removal was decided upon that uses a modified version of the strappo technique. After consolidation, lead removal, and tear mending, the Mowbray canvases were mounted onto rigid supports. The specific layering structure of the mounting system was developed after an extensive literature search of previous methods as well as the creation of mock-ups. The murals were lined onto sailcloth with an interleaving layer of nonwoven polyester. Aluminum honeycomb panels were shaped and prepared in-house with inset wooden edging, and four-ply museum board was adhered to the panels. The lined canvases were then cold-lined onto the prepared panels. The layering system resulted in a surface that aesthetically mimics that which the artist

intended and allows for several options for reversibility should it be necessary. As the paintings will be hung at a height of 16 feet, they will be consistently viewed in raking light. For this reason, a filling system was chosen that could closely mimic the low, brushy impasto. Beva Gesso was toned with dry pigments, thinned, and applied in a consistency that mimics the lean oil paint used by Mowbray. The fill can then be both carved and manipulated with heat tools to sculpt a surface that continues the brushy pattern of the original.

## COLLECTIONS RISK ASSESSMENT AT THE DENVER MUSEUM OF NATURE & SCIENCE

*Judith A. Southward, Conservator, and Heather H. Thorwald, Registrar, Denver Museum of Nature & Science; Garnet L. Muething, Risk Analyst, and Robert H. Waller, Senior Risk Analyst, Protect Heritage Corp.*

The Denver Museum of Nature & Science (DMNS) received funds from the Institute of Museum and Library Services-Museums for America program to complete a risk assessment of collections in storage. The goal of the project was to develop a preservation strategy based on a systematic and quantitative evaluation of risks to the collection. This involved identifying both the loss in the value and the risk parameters for the collections.

The DMNS collections contain more than one million objects in the areas of anthropology, earth and space sciences, zoology, and library and archives. They are scattered in 49 locations, only one of which has conditions that meet optimal museum standards. The other 48 locations are crowded and lack one or more important feature such as fire detection and suppression systems, centralized security, or temperature and relative humidity controls. These conditions jeopardize long-term stewardship, restrict public access, and place human safety at risk.

Risks to the collections had been identified in previous conservation assessments. Still, the DMNS lacked a comprehensive and balanced understanding of all risks affecting collections in storage. A more holistic understanding was required for operational preservation funding and is critical for the inevitable trade off decisions that will occur in the value engineering phases of facility concept and design that are scheduled to begin in 2010 as the museum prepares to build a new collections storage facility. For example, when cost savings must be found and the museum is given the choice of reducing investment in security, climate control, or fire protection which choice will have the least impact on any expected long term loss of collection values?

The poster will discuss the process and outcomes of the risk assessment as it occurred at the DMNS. Participating staff included Research and Collections, Security, Facility Operations, and the Board Champion for Collections. Working with the museum's one million objects, staff identified 31 collection units to evaluate. A comprehensive list of risks was developed based on the Cultural Property

Risk Analysis Model developed at the Canadian Museum of Nature. In this model, the magnitude of risk is measured as the product of a fraction susceptible, loss in value, probability, and extent ( $MR = FS \times LV \times P \times E$ ). As part of the risk assessment, DMNS staff identified an average of 91 risks specific to the collection units. These risks were grouped into categories of rare, sporadic, and continual events. An example of a rare event in the Denver area is an earthquake. An example of a continual event is light damage received in open storage. Staff also identified three kinds of value within each loss of value (LV) estimate. These were discipline, historic, and public access values.

The technical result of the risk assessment exercise is a comprehensive accounting of all identifiable risks to the collections. This will serve as a basis for rational preservation resource allocation both in ongoing collection care and in new facility design. The less tangible but equally important result is a vastly improved mutual understanding of collection preservation issues among all parts of the museum.

## A CASE OF COLD LINING USED IN THE CONSERVATION OF THANGKA PAINTING

*Hsin-Chen Tsai, Andrew W. Mellon Fellow,  
Museum of Fine Arts, Boston*

This article describes the treatment of a Tibetan painting in the collection of the Museum of Fine Arts, Boston. The painting had been mounted into a Japanese panel format prior to entering the collection in 1906. Returning the painting to a traditional Tibetan format was the goal; therefore, the treatment involved removing the painting from the panel mount. Various techniques and materials were explored for appropriateness in order to facilitate placement of the painting into a new traditional stitched brocade mount. Since the painting had been cut down and the original stitch holes lost as well as the paint layers being slightly water-sensitive, it was decided that cold lining using the Lascaux Acrylic Glue 498 HV and a supporting fabric could provide extra edges to attach the new mount and provide proper support.

Before treatment a number of tests using mockups with Lascaux 498 HV and two different activation solvents were conducted. Lascaux 498 HV was prepared into a continuous film and used in the cold lining system. A cold lining system was built using solvent impregnated blotting paper, polyester felt, Gore-tex, supporting fabric, adhesive film, painting mockup, Mylar, and weights. Two solvents, acetone and Industrial Methylated Spirits (IMS, the mixture of 95 parts ethanol, 4 parts methanol and 1 parts water) were tested with different activation times for the cold lining system. The parameters tested were bond strength between mockup and supporting fabric and reversibility. The result of these tests showed that using IMS and Lascaux 498 HV with an activation time from 40-50 minutes provided the desired level of bonding, support and reversibility.

## A PIECE OF HISTORY: THE ANALYTICAL STUDY AND CONSERVATION TREATMENT OF MADONNA AND CHILD, ATTRIBUTED TO ANDREA SCHIAVONE

*Claire Walker, Third Year Graduate Student, and James Hamm, Professor of Paintings Conservation, Buffalo State College Art Conservation Department*

This poster presents the examination, analysis, and treatment of Madonna and Child, an oil painting on canvas attributed in 1914 to Andrea Schiavone, a 16th century Venetian painter. The examination included both traditional photographic and scientific methods of analysis and newer technologies, including computed radiography, digital infrared reflectography, and Fourier transform infrared spectroscopy and Raman spectroscopy. The combination of these powerful analytical techniques confirmed key findings such as the presence of lead-tin yellow type II, a pigment that fell out of use between 1750 and 1940, and the discovery that the painting had been cut down from a larger composition. In addition, Madonna and Child was compared to other known works by Schiavone to study the artist's painting technique and inform treatment decisions, particularly during inpainting. Schiavone scholar Dr. Francis Richardson was also consulted during treatment and provided his thoughts on the painting's authenticity and authorship. The treatment of Madonna and Child unveils a dramatically transformed painting and a beautiful addition to Schiavone's oeuvre.

## THE TREATMENT OF A 16TH CENTURY MEDICI ACCOUNT BOOK

*Dawn Walus, Book Conservator, Weissman Preservation Center, Harvard University Library*

In December 2008, a 16th century Medici Family account book in the collection of Baker Library, Harvard Business School was treated at the Weissman Preservation Center, Harvard University. It is a text bound in limp vellum and secured by linen threads, leather overbands with lacings, and tackets of alum tawed skin, a virtually non-adhesive binding. It was a common structure for trade journals, accounts, and archival records from the early 15th century until the mid 19th century. This poster will illustrate the structure of the binding and the treatment steps utilized to retain the original elements of the binding using minimally invasive methods.

The binding was in poor condition when it arrived for treatment. More than half of the front cover and a small portion of the back cover were missing due to pests, most likely rodents. One-half of the leather overband (front cover, top) was missing but all others were present and in good condition. Due to the extent of loss on the front cover, there was scant evidence of turn-ins. Back cover turn-ins, however, were visible, with only moderate loss mostly near the fore edge. The sewing and sewing supports were intact and stable despite being cut between the text block and the sewing

supports after the last section. Endbands were intact but the peripheral sewing was broken and loose. In addition, the tawed ties around the headband were untied and loose.

Filling the losses to the front and back covers was the major component of the treatment and the challenge was to fill these substantial losses, restore structural stability and visual continuity to the item while preserving the original material and maintaining the non-adhesive quality of the binding by limiting the use of adhesives. The treatment involved inserting new vellum behind the original material and securing it in place with linen thread and leather ties using existing tacket and lacing holes in the original material. For example, new tackets on the front cover were sewn through original lacing holes with linen thread next to and, when possible, under the leather overbands, minimizing their appearance. Original tawed ties were removed, reserved, and reused, if possible. New holes were punched and new tackets were inserted for the turn-ins, using the arrangement of tacketing on the back cover as a guide. The partially missing overband on the front cover was reconstructed in leather and was attached to the new cover material with leather lacing consistent with the original pattern. Three small tackets of linen thread were inserted through the front cover near the bottom overband and a small amount of isinglass was used to lay down the curling edge; the only instance of piercing through original material and one of few where adhesive was used. Other instances of adhesive use included repairing two small tears to the vellum with goldbeater's skin/leather and gelatin/isinglass. The treatment of the back cover was performed in a similar manner.

As a result of this minimally invasive treatment original materials were preserved and the losses were filled with a structurally sound and a visually sympathetic repair using reversible materials and techniques.

## DONATO BASTIANI AND THE ORIENTAL INSTITUTE MUSEUM

*Alison Whyte, Assistant Conservator, Oriental Institute Museum*

This paper will discuss the work carried out by Donato Bastiani in the early part of the 20th century on archaeological material in the Oriental Institute Museum's collection. Mr. Bastiani trained as a sculptor and worked for a time under Lorado Taft, creator of the Fountain of Time sculpture located in Chicago's Hyde Park. Bastiani was then employed as a restorer by the Oriental Institute Museum. His projects included major restorations to monumental sculptures including Neo-Assyrian stone reliefs, a colossal statue of Egyptian Pharaoh Tutankhamun, and a colossal stone bull's head from the site of Persepolis, Iran. The paper will include a discussion of the materials and methods used by Bastiani and address how conservation treatment methodology and techniques have evolved over time at the Oriental Institute Museum.

## FROM KEEP OUT TO HANDS ON: CHANGES ON CONSERVATION PRACTICES

*E. Nathalie Wierdak, Archaeologist, PG in Cultural Management, Research Specialist, Cultural Diversity Centre*

Conflicting demands of research, education policies, politics, economic development and the increasing tourism industry present archaeologists and those involved in the management of archaeological resources with ever more difficult decisions, regarding the successful management of archaeological heritage. Innovative and sustainable solutions are essential and must include communities in preserving their cultural heritage.

The Sicarigua Community Museum includes a variety of archaeological materials from the region dating from pre-Hispanic times. An education program seeking to encourage wider appreciation of their past among young learners, began in 2007. The goal was to help children understand, value, and enjoy their cultural environs and become custodians of their heritage. Children participated in an archaeological project coordinated with the elementary school; they excavated and conserved artifacts and encouraged family members to participate during weekends. This education program had such a positive impact that the neighboring area of Los Arangues, where the community has engaged local authorities in construction of a museum, asked our assistance in recovering a collection neglected for more than 15 years.

Conservation of cultural heritage faces many threats: pollution, war, political conflicts among others. However our biggest threat is ignorance. The best way to preserve our heritage is through education and community participation; inviting all those who were told to keep out to take part in a hands on experience which stimulates creative responses and creates an environment for children to learn, think on their own, and have greater awareness and appreciation of their own cultures and the diverse cultures of this changing world we all inhabit.

We hope this project serves as inspiration for archaeological investigations to be developed with an integrated approach of social participation and inclusion.

## NOTES

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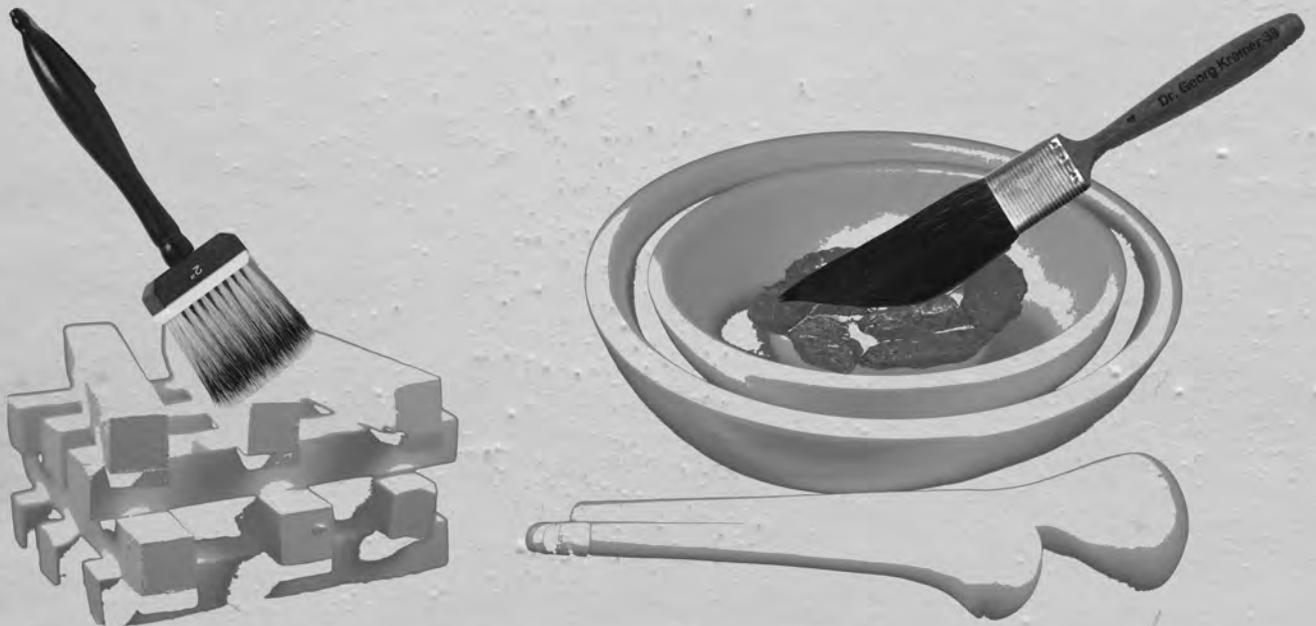
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