

American Institute *for* Conservation
of Historic and Artistic Works

AIC'S 41st Annual Meeting

The Contemporary in Conservation

Abstract Book 2013



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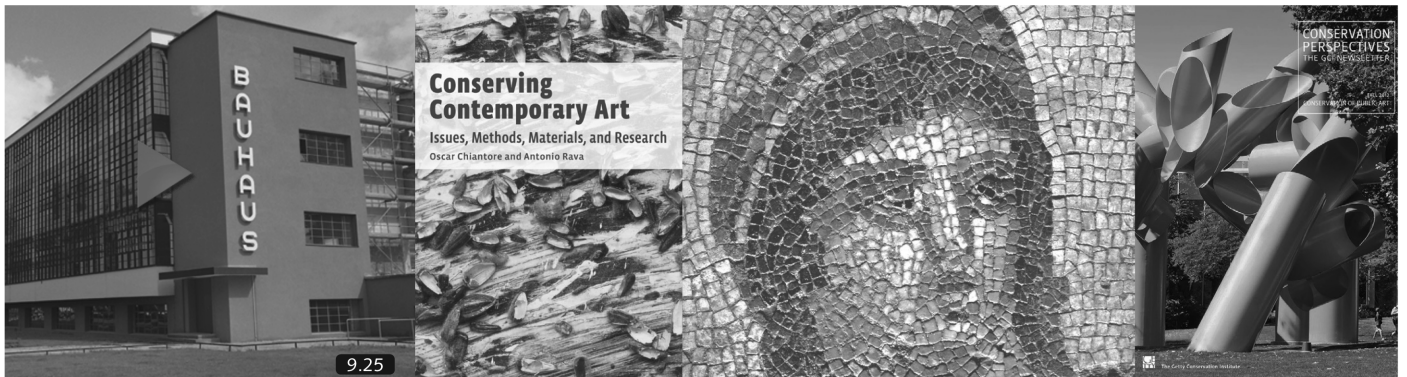
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ABSTRACTS 2013

THE AMERICAN INSTITUTE FOR THE CONSERVATION OF HISTORIC & ARTISTIC WORKS

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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41ST ANNUAL MEETING

The Contemporary in Conservation

May 29– June 1, 2013

JW Marriott

Indianapolis, Indiana

The theme of AIC's 41st annual meeting is *The Contemporary in Conservation*, with sessions focusing on contemporary approaches to conservation, not only the conservation of contemporary art, and including perspectives from within as well as outside the field. This meeting's General Session will have an opening session on Thursday, discussion sessions throughout, and a Great Debate closing session, hosted by Richard McCoy. In addition, there will be two concurrent Contemporary Art Sessions on Friday afternoon, May 31, 2013. Specialty sessions will be held Thursday afternoon through Saturday afternoon.

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Opening Session

Collecting the Performative: The Role of the Conservator in the Conservation of Performance-Based Art

Dr. Pip Lawrenson, Head of Collection Care Research, Tate

In 2005 Tate acquired its first two performances, a work by Roman Ondak called *Good Feelings in Good Times* 2003 and *This is Propaganda* 2002 by Tino Sehgal. Despite no material component existing for either work, Tate's conservation department shares the responsibility for ensuring that we can continue to display these two works, and our increasing collection of performance-based artworks, into the future.

This paper explores impact of this move by contemporary art museums to collect performances on conservation and reflects on how an engagement with these works has led to some surprising shifts in perspective for other areas of more traditional conservation practice. For example working with these forms of intangible heritage has had an effect on thinking around the museum's ongoing relationships with artists, the role of memory in the conservation of a collection and an emerging conception of the museum as archive.

The research that informs this paper has been carried out under the auspices of the research network *Collecting the Performative* which is jointly funded by the Arts and Humanities Research Council within the UK and the Netherlands Organisation for Scientific Research. This network looks at practice within dance, theatre and activism and asks how methods for creating legacy within these arenas can inform emerging conservation practice for performances collected by contemporary art museums.

Contemporary Colorant Change: Assessing Changes in the Herblock Collection due to Exhibition and Storage of Fugitive Media, Part II

Fenella G. France, Chief of the Preservation Research and Testing Division, The Library of Congress; Ha Young Park, Masters in Paper Conservation, Accademia di Bella Arti di Brera; Holly Krueger, Head of the Paper Conservation Section, Conservation Division, Library of Congress; Meghan Hill, Preservation Imaging Technician, PRITD; Cindy Connelly Ryan, Library of Congress Preservation and Testing Division; and Matthew Kullman, Scanning Electron Microscopy Specialist

The Herblock foundation donated the entire collection of editorial cartoonist Herbert L. Block (Herblock) to the Library of Congress after he passed away in 2001. The collection included 14,400 original drawings for his daily published cartoons and 50,000 rough sketches. A previous presentation at AIC in 2009

introduced concerns with the collection, since the bequest to the Library required that some of the collection must be on exhibit at all times, and Herblock began using light sensitive materials in the 1970s. Conservators were able to collect a sample of the materials he was using at the time of his death which included porous point pens (felt-tip pens), whiteout, colored pencils, ball point pens, lithocrayons, india ink, graphite pencils and pressure sensitive labels (Avery labels), as well as a stock of the coquille paper board substrate containing optical brighteners he favored throughout his career.

The continuation of this research begun in 2009 encompassed a long-term longitudinal study of the impact of exhibition conditions on contemporary media and substrates. While light exposure on exhibition was an issue, conservators and curators had observed fading of a selection of some of the drawings while in dark storage. To assess changes occurring in Herblock collection materials, and accurately identify the media involved in these changes, sample sheets (Whatman paper and coquille board) of the collected media were created and aged both naturally and with a range of accelerated aging techniques. Aging encompassed both light and dark aging to determine the mode of degradation, with combinations of ultraviolet (UV) and visible light (without UV), moderately raised temperature, relative humidity and dark conditions with sample sheets monitored during carefully controlled natural and accelerated aging. Progressive non-invasive and mildly invasive analyses were undertaken both before and after successive aging periods. Instrumentation included hyperspectral imaging, UV-VIS colorimetry, micro-fade-ometer, and micro-sampling of sample sheets for scanning electron microscopy (SEM). Additional analyses to identify specific components of media shown to have faded or changed in color after various aging methods (such as porous point pens) then underwent separation of ink components with thin layer chromatography (TLC) and analysis with Direct Analysis in Real Time (DART) Time-of-Flight Mass Spectrometry. Additional hyperspectral imaging was undertaken of specific Herblock drawings from the period 1974-2001 that had been either on exhibit or kept in the dark.

These drawings all contained the full range of media collected in the sample set. India ink was used as a reference for stability throughout the testing. All the environments where the drawings were located were monitored, and predictive fade testing with the micro-fade-ometer indicated some interesting results for a number of these contemporary materials, with comparisons between the three spectroscopy techniques indicating limitations and benefits in the analytical techniques. SEM EDS confirmed the composition of the optical brightener in the coquille board. The identification of the color change in media and the method of degradation for both exhibit and storage conditions sought to replicate natural aging as closely as possible, and provide long-term useful information for the preservation of this unique collection of modern contemporary materials.

Panel: Collaboration in Design: Expanding the San Francisco Museum of Modern Art (SFMOMA)

Craig Dykers, Principal, Snøhetta Architects; Sam Anderson, Principal, Samuel Anderson Architects; Ruth Berson, Deputy Museum Director for Curatorial Affairs, and Jill Sterrett, Director of Collections and Conservation, SFMOMA

This panel will explore trends in contemporary art museum design through the current expansion project at SFMOMA. Three words—generous, magnetic, and transformative—have guided the expansion planning and design process. How are these three ideas reflected in the building design and how will they be manifest in the resulting museum programs?

Craig Dykers (Principal, Snøhetta Architects), Sam Anderson (Principal, Samuel Anderson Architects), and SFMOMA staff Ruth Berson (Deputy Museum Director for Curatorial Affairs) and Jill Sterrett (Director of Collections and Conservation) will describe the debates and collaborations behind the design of spaces and systems that activate and animate—yet respect and preserve—contemporary art, and that invite our public's inspired engagement in the multi-faceted discourse of museums today.

Discussion Sessions

Scientific Research Needs Survey Discussion Group

Stephanie Porto, Niagara Art Conservation

In the spring of 2012, the Research and Technical Studies group (RATS) distributed an online survey in order to better understand the current scientific practices of the conservation community. Goals of the survey included the following: learn more about the needs of AIC membership regarding scientific research and poll members on how AIC might assist members in meeting those needs; find out how members feel about working with both conservators and scientists on conservation research and gauge member interest in pursuing collaborations with conservators/scientists; and collect information that may be useful in facilitating collaborations via a new web resource sponsored by the NSF's Chemistry Coalitions Workshops and Communities of Scholars (cCWCS) program.

A thoughtful review and discussion of the survey results has been undertaken by RATS and AIC to determine how to assist members in locating the resources needed to properly understand and care for heritage objects through scientific inquiry. To this end, a discussion session at the 41st Annual Meeting is proposed in which a panel of RATS members will present some of the major trends demonstrated by the survey and lead a discussion of those trends with audience members.

Members of the panel discussion session will include RATS founding member and head of the NCPTT Materials Conservation Program, Mary Striegel, Head of the Preservation Division of the Arizona State Museum and Professor at the University of Arizona, Nancy Odegaard, Senior Conservation Scientist at the Indianapolis Museum of Art, Gregory Smith, Professor of Chemistry at Millersville University, Patricia Hill, and Chief of the Preservation Research and Testing Division of the Library of Congress, Fenella France.

The perspectives of these scientists and professors combined with the viewpoints from the general AIC membership shared at this discussion session will be compiled after the meeting in order to form recommendations for possible future AIC initiatives, including workshops, webinars, or the formation of a specialized AIC network.

Then vs. Now: Fundraising for Conservation Isn't What It Used To Be

Susan Mathisen, President, SAM Fundraising Solutions

As little as ten years ago, funding requests for conservation projects usually consisted of describing the object, providing treatment details, and stressing the significance of the artifact being conserved. Benefits were often demonstrated through the object's potential

use to bolster exhibition content or educational programs.

How times have changed. Today, foundations are reevaluating their giving and are looking for considerable impact for their “investment.” Government agencies, if not zeroed out, need to advance strategic plans or are forced to award grants that fulfill regional economic priorities. Individuals are re-assessing their giving due to the market’s fluctuations. These changes in the philanthropic world mean fundraising for conservation is no longer just about the importance of an object’s long-term preservation. Now, economic value, community revitalization, sustainability, defined outcomes or demonstrable impact, and audience engagement are among the funder priorities that must be addressed in proposals or asks.

This session will re-visit what was, but its main focus will be on the current funding climate. Topics, such as community engagement, audience development, crowdsourcing, demonstrating impact, global initiatives and philanthrocapitalism, and soliciting different donor pools, will be addressed through formal presentation and case studies.

Conservation Treatment Documentation Databases

Jay Hoffman, President & CEO, Gallery Systems; Linda Holmeke, Conservator, Folger Shakespeare Library; Sarah Norris, Conservator, Texas State Library and Archives (moderator); and Merv Richard, Co-Principal Investigator, ConservationSpace, and Chief of Conservation, National Gallery of Art

As conservation moves into the digital age, conservators seek to transition their treatment documentation from the filing cabinet to the database. Database standards for treatment documentation have grown organically and independently among institutions, with solutions of widely varying complexity. This panel discussion seeks to establish trends among systems; to clarify those systems’ relative strengths and weaknesses; to reduce redundancies of effort among developing institutions; and to illuminate future directions in design and use.

This discussion session will incorporate a variety of database development perspectives: independent, open-source, and vendor-based. Independent databases developed in-house by institutions often rely upon consumer software or contracted programmers. Open-source solutions work toward cooperatively established, interoperable standards. Vendor-based solutions address documentation within existing, proprietary software. Public discussion of these efforts aims to address questions such as:

- What is the basic structure of these various systems?
- How do these systems manage both photographic and written documentation?
- How do databases address the needs of libraries, archives, and museums?
- How can databases facilitate workflow within an institution?

- How do these systems ensure data security?
- What IT support is required for these systems?
- What are the user costs for these systems?
- What data migration might be required in the future?

Engaging with Allied Fields: Teaching Conservation in Allied Academic Departments and Degree Programs

Suzanne Davis, Curator of Conservation, Kelsey Museum of Archaeology; and Emily Williams, Conservator of Archaeological Materials, Colonial Williamsburg Foundation

AIC and the conservation community are beginning to critically examine the values that drive our profession, as well as how we communicate the ethics, goals, and key concepts which form the core of modern conservation practice. Many practicing conservators teach and/or lecture for undergraduate and graduate programs in allied career tracks such as archaeology, art history, information and library science, museum studies, and the sciences. In most cases, the overarching aim is to introduce students to the field of conservation. However, contemporary conservation is a diverse and complex field, and it can be challenging to communicate relevant information in one term or, in the case of a guest lecture, a single class period. This interactive session critically examines the goals and methodology of teaching conservation information to non-conservation students, with the intention of beginning a collaborative, cross-disciplinary dialogue that will result in both theoretical and practical resources for conservators teaching in university settings.

The objectives of this session are to:

- 1) examine conservators’ shared pedagogical mission
- 2) explore how conservators interpret/communicate key values in class settings
- 3) assist teaching conservators with course content development and teaching strategies
- 4) launch a continuing dialogue about the goals of teaching, as well as its impact and efficacy

The session will utilize a non-traditional presentation format (a lightning round) as well as a guided, audience-participatory discussion. Empirical data from a survey on conservation and teaching will also be presented. In order to feature a variety of viewpoints and strategies, and to provide context and inspiration for the discussion, selected speakers who teach in a variety of academic departments will guide the lightning round.

To provide a foundation for understanding and examining current trends in teaching and learning about conservation at the university level, the session chairs will present data from an online survey conducted in advance of the session. In brief, the goals of the survey are to learn how many conservators currently teach in allied programs, in what departments or settings they teach, and what they feel is most important to communicate to students. The resulting data will be used to shape questions for

the discussion portion of the session. The audience-participatory discussion will comprise at least one third of the 90 minute session time and is designed to engage all session attendees in a conversation about shared goals when teaching students in allied career tracks, the desired impact of such teaching, and successful teaching strategies.

What is Value?—A Socratic Dialogue

Moderator: Dr. W. (Bill) Wei, Rijksdienst voor het Cultureel Erfgoed, Amsterdam, The Netherlands

The recent AIC annual meeting in 2012 with the theme “Outreach,” along with the last few AIC annual meetings, showcased excellent initiatives to help define what it is that conservators do and why preserving cultural heritage is so important. This discourse is all the more important, given that one of the most important contemporary issues facing conservators is the effect of the economic crisis and cost cutting on conservation as a whole. AIC members must continually defend their work and answer questions posed by funding agencies and sponsors, local, state, and national governments, the general public, and even many museums themselves. These include critical questions such as

- what is the *value* of cultural heritage in this day and age,
- how does one determine what is *worth* conserving, and
- why should cultural heritage be conserved, that is, why is conservation and why are conservators *valuable*.

These and other questions concerning the term “value” have a wide variety of answers depending on the context in which the word is used.

What is value? This question will be discussed in the form of a so-called Socratic dialogue. This is a structured form of dialogue in which *all* participants actively contribute. The purpose of the dialogue is not to solve the question at hand, that is, specifically define what value is, but to investigate each other’s experience and opinions related to value, and to try to determine the essence behind the word. What is it that conservators and other cultural heritage professionals are concerned about when they ask and talk about value? What is the essence of the word? The Socratic dialogue will help the participants understand what is behind the notion of value, so that they can better formulate arguments to convince people to continue to support conservation efforts throughout the country and abroad.

Closing Session

The 2013 Great Debate at AIC

Moderated by: Richard McCoy, Conservator of Objects & Variable Art, Indianapolis Museum of Art

Building on the rousing success of the 2012 Great Debate at AIC, this year’s Great Debate will again feature up-and-coming and leading conservators competing in an Oxford-Style Debate format. Debate sessions will be moderated by Richard McCoy.

The Great Debate at AIC will consist of two, back-to-back debate sessions, each with purposely difficult and controversial topics. Both debate sessions will have two teams with three debaters per team. Each team will be selected by the moderator in advance of the Annual Meeting.

Members of the two teams will be selected from AIC membership; those chosen will be members that are interested in engaging in a debate that considers a topic from all perspectives. Each team’s goal will be to win the debate, not necessarily to defend their personal stance on a topic.

The two topics are:

- **While volunteers used on preservation projects often allow us to accomplish more work, they undermine our capacity to regularly employ conservation and collections care professionals.**
- **The greatest act of preservation for inherently fragile or fugitive cultural property is exhibition, even if the duration goes far beyond what is currently recommended.**

Contemporary Art Sessions—Track 1

Making Marks: An Ethical Dilemma in the Creation of Art

Megan Emery, Associate Conservator of Objects, Cincinnati Art Museum

Artist Todd Pavlisko has made his mark as a conceptual artist, most notably with the video triptych *Centerpiece*, which documents him driving a nail through his own foot. When an exhibition of Pavlisko’s work was proposed for the summer of 2013 at the Cincinnati Art Museum, little was known of what the artist would suggest for a new work which would relate to the museum gallery space and collection. Therefore, when Pavlisko submitted a proposal involving a former Navy SEAL firing a tactical rifle inside the Cincinnati Art Museum many staff members were rightfully concerned but the museum was committed to the exhibition and wanting to support an artist with local roots. With one curator strongly in support of the project, another adamantly opposed, and the rest of us stuck somewhere in between, we were left to work out a solution to a dilemma that challenged our ethics and the museum standards we are so dedicated to uphold. The safety of staff, art work, and the physical building were of immediate concern. We were also required to consult with our fine art insurer to see what penalties we might encounter.

With a verdict that we would proceed, a second even more challenging decision had to be made: temporarily relocate two life-size marble sculptures or allow a professional marksman to fire a tactical rifle twelve inches to the side? The instinctive reaction was to move the sculptures; however what action was honestly more likely to put the objects at risk, physically moving them to and from with gantry or allowing someone who is professionally trained to make the mark? Conversations, while focused on the objects’ safety, strayed to the professional conscience. What will my colleagues think? Will the institution earn a bad reputation leading to the withdrawal of loans or exhibitions? Or will it have the opposite effect and mark the Cincinnati Art Museum as a progressive institution in the contemporary and conceptual art world?

This presentation will provide an overview of the project and subsequent exhibition, while focusing on the decision making process, the outcome, and final thoughts on the success of the project.

Nam June Paik: Global Visionary: From the Archive to the Exhibition

Tiarna Doherty, Chief of Conservation, Smithsonian American Art Museum; Lucian H. (Hugh) Shockey, Objects conservator, Smithsonian American Art Museum; Catherine Maynor, Paper Conservator, Smithsonian American Art Museum; Michael Mansfield, Associate curator of Film and Media Arts, Smithsonian American Art Museum; and David Gleeson, Exhibition Designer, Smithsonian American Art Museum

This paper, which is about mounting a complex exhibition, will highlight the efforts made to preserve and restore Nam June Paik’s Archive and artwork. The influence of the artist’s own philosophy about materials and the role of curatorial interpretation will be integral to the discussion of the conservation and restoration work carried out for the exhibition “Nam June Paik: Global Visionary.”

The Smithsonian American Art Museum acquired the Nam June Paik Archive in 2009. Nam June Paik (1932–2006) transformed video into an artist’s medium and has had a major influence on late 20th century art and continues to inspire living artists. The Nam June Paik Archive includes works of art in various media such as paintings, drawings on newspapers and paper, sculptures, videos and televisions. In addition, there are numerous materials the artist collected for future artworks. Electronic media for presenting the artist’s video installations makes up a large part of the archive.

Materials from the archive as well as from the permanent collection of the museum will be on display in the exhibition “Nam June Paik: Global Visionary” from December 2012–August 2013. The work done by a team of designer, curators, an electronics integrator, and conservators will be presented. Considerations and decisions made about the display of both archive material and electronic media will be discussed. The various ways in which the museum collaborated with other institutions in securing loans will also be addressed. The restoration of electronic media including multi-channel installations of “Electronic Superhighway: Continental U.S., Alaska, Hawaii” and “Megatron/Matrix” will be reviewed and evaluated. The restoration of a robot assemblage, made of composite materials and television screens, will help illustrate how artwork is appropriated for Social Media purposes in promoting an exhibition.

Working Together Through *Hard Truths*: The Conservation and Exhibition of Thornton Dial’s Complex Artworks

Laura Kubick, Assistant Conservator of Objects & Variable Art, Indianapolis Museum of Art; Kathleen Kiefer, Senior Conservator of Textiles, Indianapolis Museum of Art; Richard McCoy, Conservator of Objects & Variable Art, Indianapolis Museum of Art; Brittany Minton, Registrar for Exhibitions, Indianapolis Museum of Art; and Brose Partington, Kinetic Artist and Independent Mountmaker, Workzone Studio Arts

The contemporary artist Thornton Dial was born in 1928 in Sumter County, Alabama; his work is rooted in the under-represented visual art traditions of the African-American South and presents potent commentaries about social issues such as war, racism, politics, and poverty. While his work has been included in the Whitney Biennial as well as in solo exhibitions at the New Museum, the Houston Museum of Fine Arts, and the Museum of American Folk Art, the Indianapolis Museum of Art’s touring exhibition *Hard Truths: The Art of Thornton Dial*,

is the most extensive and widely recognized show of the artist's work ever mounted.

Dial creates very large, complex assemblages of scavenged materials—textiles, scrap metal, animal bones and hides, plastics, wood, glass, epoxy modeling compound, and paint. Many of the materials in the works were already in a deteriorated state at the time in which Dial created his artworks, and most of the works were subjected to storage conditions that did not meet museum standards before the exhibition. These facts made the artworks especially challenging to prepare, pack, ship and conserve. In order to do so, IMA conservators traveled twice to Dial's studio in Bessamer, Alabama, to interview Dial in order to learn more about him as an artist and how to approach the care of his work. Discussions with the artist and his family directly informed the approach that the IMA followed throughout the entire exhibition process. Many pieces included in the show required fumigation and treatment ahead of the exhibition. As the exhibition proceeded, further challenges were faced as damages occurred during shipping of the works between venues.

Close collaboration between the registrar, textile and object conservators, mountmaker, and curator was essential to making the exhibition a success. This paper will present the honest story about the challenges of planning and executing this exhibition of immensely important, but complex and fragile contemporary works of art. While the inherent risks in transporting these artworks were recognized by the IMA staff, it was clear to those involved in the project that these risks were greatly outweighed by the opportunity to introduce Dial's work to a wide audience.

Robert Rauschenberg at the San Francisco Museum of Modern Art: an Online Scholarly Catalogue

Paula De Cristofaro, Paintings Conservator, San Francisco Museum of Modern Art

The San Francisco Museum of Modern Art is fortunate to possess an outstanding collection of works by the late Robert Rauschenberg. The collection includes early paintings that depart from typical painting practice, fragile mixed-media collage, graphic works that defy the traditional use of paper media, and sculptures incorporating found objects. The Rauschenberg holdings at SFMOMA were substantially expanded in 1999 when works which were retained in the artist's own collection were made available for acquisition by the museum.

SFMOMA honors Robert Rauschenberg's legacy by exhibiting, lending and studying these works while taking appropriate conservation measures to insure that the Rauschenberg collection will be exhibited and enjoyed in perpetuity. The SFMOMA conservation and curatorial staff have worked closely with the Rauschenberg Foundation throughout the accession process and during subsequent study of the collection.

In 2009, SFMOMA received a planning grant from the Getty Foundation's Online Scholarly Catalogue Initiative to catalogue

all 88 works by Robert Rauschenberg in the permanent collection. A second award was received in early 2012 to support the full implementation of the online catalogue. The Getty Online Scholarly Catalogue has provided a special opportunity for SFMOMA's conservation staff to study the museum's Rauschenberg collection in depth, and to treat several of these masterpieces.

The Online Scholarly Catalogue will introduce readers to information that has been previously difficult, if not impossible, to access via traditional hard-copy publications.

The website will present interviews with Rauschenberg, documentation which captures SFMOMA staff visits to the artist's foundation, and will offer a record of the creation of mock-ups and conservation treatments of the artist's works. A study of the materials Rauschenberg used to create his art and ephemera related to his art works will also be featured on the website. The Online Scholarly Catalogue is scheduled to launch in summer 2013, resulting in SFMOMA's first scholarly publication online. The material presented in the Online Catalogue will surely captivate scholars, professionals, experts and a lay audience who all share an interest in Robert Rauschenberg's oeuvre.

This presentation will focus on several Rauschenberg works, including two from the early 1950s: *Untitled* (glossy black painting) and *White Painting* (three panel), along with *Collection*, a 1954 combine painting. Each of these works presents conservation, preservation and installation challenges, and each work was closely studied during the course of the Online Scholarly Catalogue project.

Automating Classification of Historic Photographic Paper from Surface Texture Images

Paul Messier, Conservator of Photographs in Private Practice; Richard Johnson, Geoffrey S. M. Hedrick Senior Professor of Engineering, School of Electrical and Computer Engineering, Cornell University; James Coddington, Agnes Gund Chief Conservator, Conservation Department, Museum of Modern Art; Patrice Abris, CNRS, Directeur de Recherche, SISYPHE, Ecole Normale Supérieure de Lyon, France; Phillip Klausmeyer, Conservation Scientist and Associate Paintings Conservator, Worcester Art Museum; Andrew G. Klein, Assistant Professor, Department of Electrical and Computer Engineering, Worcester Polytechnic Institute; Eric Postma, Professor, Tilburg Centre for Creative Computing, Tilburg University; William A. Sethares, Professor, Department of Electrical and Computer Engineering, University of Wisconsin; Sally L. Wood, Chair and Professor, Department of Electrical Engineering, Santa Clara University; and Lee Ann Daffner, Andrew W. Mellon Foundation Conservator of Photographs, Museum of Modern Art

Digital imaging and signal processing technologies offer opportunities for conservators and affiliated researchers to answer long vexing questions in new and potentially more quantitative ways. This paper will present a collaborative project to systematically and semi-automatically characterize the surface texture of historic photographic papers.

Surface texture is a vital attribute defining the appearance of a photographic print. Texture impacts tonal range, rendering of detail, reflectance and conveys subtle, qualitative information about the aesthetic intent of a photographer. During the 20th century, manufacturers created a large diversity of specialized textures. Identification of these textures yields important information about the origin of a photographic print, including the date and the region of manufacture.

A texture library of photographic papers containing over 2,000 identified surfaces has been assembled using a simple system for capturing photomicrographs. Lacking a query and retrieval mechanism, this library has only the most basic application for the identification of unknown textures. Addressing this deficit, practical applications are being tested as part of The Museum of Modern Art's project to characterize photographs from its Thomas Walther collection (funded in part by the Andrew W. Mellon Foundation).

Paper texture is being documented by reflectance transformation imaging (RTI) and raking light. RTI and raking light data have been collected on a microscopic scale for dozens of samples, including (1) 80 samples about 30% of which have known matches and (2) 90 samples in 3 sets of 30: (a) 10 texture samples from different locations on one piece of paper, (b) 10 texture samples from different pieces of paper taken from the same manufacturer's package, and (c) 10 texture samples from the same manufacturer, manufactured to the same specifications and in the same time period but from different manufacturer packages.

Using these data, automatic classification procedures have been developed through a collaborative competition by teams at different universities. Each team used a different strategy for deriving the most accurate and efficient algorithm for matching texture images from an unknown sample to a short list of identified references with similar textures gleaned from the library of known textures. The results of this competition will be discussed with a summary of remaining challenges.

The classification procedures generally divide into two parts: Feature vector extraction from the images followed by similarity evaluation of the feature vectors. For these tasks many algorithms are plausible with strengths and weaknesses dependent on the peculiarities of materials being analyzed. For example Fourier, wavelet, and multi-fractal analysis may have greater or lesser success on certain types of surfaces based on the physical characteristics, including isotropy and roughness, of the sample. The performance of the better schemes will be summarized in the presentation.

The techniques developed through the challenge may have applications for rapidly and inexpensively assembling texture libraries of other photographic papers, such as inkjet papers, and of other materials such as textiles and painted surfaces and for accessing these texture collections through database query and retrieval methods.

When Conservation Means Stapling: Touring an Unsupported, Unglazed, 9ft x 21ft, Oil Paint Stick on Paper to Three Venues

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

The loan of traditionally hinged, matted and framed works of art on paper is guided by well established protocols for safe shipping, handling and display in exhibitions both nationally and internationally. Can and should these standards be enforced when considering the loan of contemporary works on paper requiring non standard installation and display requirements? Can the conservator marry preservation and aesthetic integrity while fulfilling artist and institution expectations?

In 2009 the Art Gallery of Ontario (AGO) received a request for loan of an oversize work on paper by the American artist Richard Serra. *Untitled, 1974* is an oil paint stick on paper measuring 9' x 21' installed. The drawing is composed of two horizontal sheets each 5' x 21' which are overlapped, the bottom sheet overlapping the top sheet. It was originally installed directly on the wall using staples.

From the beginning the loan request was enthusiastically supported, but no one was expecting the drawing to be in exhibitable condition given its age (38 years), the use of oil paint stick media, and its 30 year rolled storage condition. Documentation was found to be incomplete and installation details missing. The sheer size of the work and its installation configuration presented immediate logistical problems. When the drawing was found to be in acceptable condition, the search for an installation methodology that would insure safe and expedient installation of the artwork at three venues and which met both the artists and conservators specifications became paramount and ended up defining the parameters of the loan.

This presentation will highlight major conservation issues and unique problems encountered during the process of examination, preparation and installation of the drawing. In particular the decision to lift the drawing by hand to the wall and install with staples is discussed and illustrated with visual documentation taken on site at the three venues. Methods for problem solving such as the use of full size mockups are outlined. The success of the loan parameters used is summarized.

Artist Materials Collection at the San Francisco Museum of Modern Art

Michelle Barger, Deputy Head of Conservation, San Francisco Museum of Modern Art (SFMOMA); Theresa Andrews, Photography Conservator, SFMOMA; Paula De Cristofaro, Paintings Conservator, SFMOMA; Martina Haidvogel, Advanced Fellow in the Conservation of Contemporary Art, SFMOMA; Amanda Hunter Johnson, Associate Paper Conservator, SFMOMA; and Jill Sterrett, Director of Collections and Conservation, SFMOMA

The artist materials collection at the San Francisco Museum of

Modern Art is a key component of the conservation department's mission to engage and interact with contemporary artists and their creations.

More than solely a collection of 20th and 21st century materials, this collection contextualizes contemporary art practice and celebrates the conservation department's ongoing, active relationship with artists.

Containing more than 300 objects, the ever-growing collection includes a diverse range of materials, examples of which include swatches of silk custom-dyed by Robert Rauschenberg to replace a deteriorated silk component on his combine work, photographs and documents from the Richard Avedon studio describing mounting and materials used for prints in the series, *In the American West*, DeFeo's painting trowel, original materials used in the fabrication of Eva Hesse's molded fiberglass sculptures, a vintage camera provided by Nam June Paik relating to a work in the collection and mock-ups by Richard Tuttle to test mounting techniques in advance of his retrospective.

This presentation will describe the artist materials collection and how it supports collaborative activity with artists, which is at the very heart of contemporary art conservation. The collection is being envisioned as a dynamic and accessible resource in the SFMOMA's building expansion, scheduled to open in 2016.

Contemporary Art Sessions—Track 2

Conservation Treatment of Claes Oldenburg and Coosje van Bruggen's sculpture *Monument to the Last Horse*, 1991 at The Chinati Foundation, Marfa, Texas

Bettina Landgrebe, Conservator, The Chinati Foundation

This paper presents the recently developed conservation method for *Monument to the Last Horse*, a large scale outdoor sculpture by Claes Oldenburg and Coosje van Bruggen from 1991.

The treatment is the first known and documented example of treating an outdoor sculpture comprised of the unusual materials of aluminum, polyurethane foam and resin, primer and paint, materials not commonly used in combination for outdoor sculpture. The sculpture materials, chosen because they mimicked the mud from the surrounding landscape adhering to a horseshoe, were exposed to the harsh climate of the Marfa desert environment for over 20 years. The combined materials presented unprecedented challenges for conservation.

A two-year research phase, including material testing, close collaboration with the fabricators of the art work and the artists as well as consultations with other conservators and companies resulted in a conservation concept and treatment plan, which was approved by Claes Oldenburg early in 2011.

The paper will discuss the idea of the sculpture, the fabrication, the conservation history and condition of the sculpture over the years, the research approach, tests and test results, which

finally culminated in the treatment plan.

The conservation treatment required the removal of the original paint layer, which had been on the sculpture for 21 years, despite its original life expectancy of only five to eight years.

The original paint layer not only depicted the earthy brown of the "mud" stuck to the horseshoe and gave the sculpture a finished appearance but it, originally, also protected the PUR foam and PUR resin from UV radiation, wind and rain. In the course of its 21 year life span the paint layer had however lost its gloss, become water soluble, was abraded regularly by windborne sand particles, and lost adhesion to the primer layer underneath it. The original paint layer was also heavily marked by earlier repairs and had to be removed to treat damages in the original PUR resin and PUR foam layers, caused by its failure over time, and to establish a solid foundation for applying a new paint layer.

The paper further describes and discusses the removal of the paint layer, the treatment of cracks and voids in the polyurethane foam as well as in the polyurethane resin and the application of new primer and paint layers.

Thanks to the close collaboration with the artists and the fabricator, the conservation treatment to *Monument to the Last Horse* was successful. Conservation treatment not only substantially stabilized the sculpture, but restored the appearance the artists had envisioned for it.

Modern Ruins Restored: the Conservation of *Monday, Wednesday, Saturday*

Tasia M. Bulger, Paintings Conservation Fellow, Canadian Conservation Institute

The three element sculpture, *Monday, Wednesday, Saturday* was made in 1984 by the Canadian artist collective General Idea, as an installation element for their first international, traveling retrospective. The sculptures echo phallic votive forms in Pompeian frescos, and abstract cornucopias—the horn-shaped vessels commonly depicted as overflowing with produce and fruit. They were displayed with other art objects which imitated ruins and ancient murals, complete with fake losses and stains.

The original sculptures were made of thin layers of pigmented plaster over a polyurethane foam interior, and were damaged by handling and transit between Basel, where they were constructed, and Eindhoven—the first venue of the exhibition. Subsequent travel—to Toronto and Montreal was deemed practically impossible by the artists, and the sculptures were abandoned in Europe, to be refabricated in Toronto for the third venue. The refabrications, of similar construction but paler coloring, incurred similar damages from travel as the originals resulting in a network of prominent mechanical cracks over their entire surface. After the final venue, the sculptures were placed in storage where they would remain for 24 years, until they were donated to the National Gallery of Canada (NGC) by General Idea's only surviving artist, AA Bronson.

The Fellowship project explored these sculptures and

examined treatment options, working with curatorial staff inside and out the NGC, and perhaps most importantly, the surviving member of the artist collective, AA Bronson. Technical or anecdotal information about construction was scarce and perplexing, so study was undertaken—namely x-radiography of the structures, and sampling and analysis of the plaster and foam components. In addition, a partial-size mock-up was fabricated.

Early examination and analytical study determined the three six-foot sculptures were composed of a polyurethane ester foam interior, covered with thin, pigmented gypsum. Experiments were conducted to find a suitable treatment to remove the foam and reinforce the gypsum shell should they indeed be made of the ester foam, prone to inherent degradation even without adverse environmental factors, while further analysis was conducted to validate the foam's composition. Consolidants and fill materials were tested to stabilize the fragile plaster surface, and ultimately used to treat the sculptures when the final analysis concluded the foam is the less problematic polyurethane ether.

This unique project presented the opportunity to find a suitable treatment for *Monday, Wednesday, Saturday* by addressing the challenging structural issues and fragile matte, porous, and otherwise sensitive surface of the sculptures, while paying attention to aesthetic, historic, and philosophical issues. By working together with AA Bronson, NGC navigated concerns for the sculptures' treatment and explored possible options to ensure *Monday, Wednesday, Saturday* could be exhibited in the future.

Conservation of *Wrapped TV*, 1967

Margo Delidow, Sculpture Conservator, Delidow-Meier Conservation; Jessica Pace, Projects Conservator of Objects, Brooklyn Museum; and Eric Meier, Contemporary Art Specialist, Delidow-Meier Conservation

This proposal presents the conservation of a 1967 collaborative work by Christo and Nam June Paik, *Wrapped TV*, which was undertaken in 2011–2012. The ethical and practical decisions that were required of the project both prior to and throughout the course of treatment are representative of the unique challenges that arise from the conservation of contemporary art.

Wrapped TV consists of Nam June Paik's work—a small CRT placed inside a five-sided Plexiglas box—that is wrapped with flexible PVC sheet and tied with string and twine by Christo. The object has undergone natural deterioration of the PVC, the cordage, and the Plexi glue joints. Separately, extensive damage to the Plexiglas incurred during a move rendered the object structurally unsound to hold the CRT in place. Broken Plexi also threatened to cause further damage to the PVC wrapping as the object is shifted during handling. Furthermore, damage to the Plexi distorted the overall shape of the wrapped form.

Three options were available regarding the conservation of the object: 1) Leave the work as is while acknowledging the potential damage that the broken Plexi may cause the plastic wrapping as well as the likelihood of further alterations to the shape of the object. 2) Undertake treatment of the work, which calls for

opening the plastic wrapping, examining the CRT for evidence of past treatment, stabilizing the Plexiglas box, reattaching the CRT to the Plexi, stabilizing all plastic hardware, overall cleaning, and re-wrapping of the PVC. 3) Consider Christo's offer to re-wrap the work with new plastic and/or cordage. The last option raised concerns regarding alterations to object's appearance and original intent, the addition of new materials, and the loss of original materials. It also raised the question of how the work would be understood and dated after such an extensive reworking.

The decision to treat *Wrapped TV* is guided by the object's safety, the limited window of time available before the PVC film becomes too brittle to move, and the decision to preserve the work's 1967 materials and date. Treatment was undertaken as described under option 2 with the aim of providing structural stability with minimal visual impact. The treatment retained original hardware and used online digital machining to fabricate mounts that allowed broken original plastic elements to be stabilized and retained.

Installing Maurizio Cattelan's *ALL: A Retrospective* at the Guggenheim Museum

Nathan Otterson, Objects Conservator, Solomon R. Guggenheim Museum

Strung-up, dangling, inverted, at a glance random but in fact painstakingly composed. The goal was to create a new installation that would fill the rotunda with the life's work of Italian artist Maurizio Cattelan. Certainly the Guggenheim had experience filling the void with newly fabricated, site-specific works but never before had a multitudinous collection of diverse, original artwork been brought together and hung from the rotunda skylight at the Guggenheim Museum. This was the challenge the Guggenheim team faced when standing in front of the working model for *ALL* in a studio in Milan with the artist and the Cattelan Archive. What was initially a conservator's nightmare and a huge challenge for the fabrication, mountmaking, design and registrar departments, became, after careful planning and meticulous execution, a one-of-a-kind and unforgettable exhibition at the Guggenheim Museum.

From a conservation perspective, examining and establishing object condition as well as developing mounting strategies for loans to be included in *ALL* was of the utmost importance for the safety of the artwork and museum visitors. Guggenheim Conservation and Mountmaking traveled to perform on-site assessments of many objects included in the exhibit. During these visits the works were carefully examined to determine condition and structural integrity. Each object was studied and compared to the working model to determine if the proposed hanging method was feasible or needed to be modified.

Maurizio Cattelan's work does not fall discretely into one category or medium. *ALL* included photographs, paintings, works on paper, taxidermy, textiles and sculptural works in marble, metal and wax. After a survey of the objects in the exhibit

was complete and conservation needs identified, conservators of varying disciplines from outside the museum were enlisted to share their expertise and treat pieces under the guidance of the artist, the Cattelan Archive and Guggenheim conservation staff.

Fabrication, exhibition design, conservation and art services and preparation departments, in consultation with the company GMS Engineering, carefully thought out the mechanics of cautiously lifting *ALL*. After several discussions with Cattelan regarding appearance, a design was approved. Using the working model of *ALL* as a guide, a three-dimensional computer model was made. Cables were plotted top to bottom to ensure that each piece was suspended at a safe distance from surrounding artworks, and that cables for objects placed lower in the composition had a clear path to the hanging structure. Each connection from truss to object was tested, and each component was weighed to guarantee that the total weight would not compromise the structural ribs of the skylight at the museum.

As a result of meticulous planning, the installation process was seamless. With cables set, mounts in place and hanging hardware ready, each object was carefully lifted and positioned on the hanging cables. Conservation, GMS Engineering and the Cattelan Archive carefully inspected the condition and stability of each work before the piece was lifted out of reach. One month later, a suspended kaleidoscope of Cattelan's life work welcomed the public as they entered the Guggenheim Museum.

Cow Guts: The Conservation of Two Contemporary Artworks by Doris Salcedo and by Ursula van Rydingsvard

Mareike Opeña, Contemporary Conservation Ltd., New York City; and Christian Scheidemann, Contemporary Conservation Ltd., New York City

In recent years, two artworks were treated at the studio of Contemporary Conservation in New York City, which were both reflective of challenges conservators for contemporary art are facing: Both contain inner tissue of the cow: bladder and gut. Both intestines were stretched and sewn to the sculptures' bodies while still wet and elastic; both showed more than desired shrinkage after they dried.

In the first case, the focus was to develop a method of conservation to offer an alternative to the artist's recommendation of replacement. In the second case, however, the artist approached us with questions about aging reactions and treatment solutions for an artwork still in progress.

The artwork, *Atrabiliarios* (1997), by Columbian artist Doris Salcedo, came to the studio in poor condition after a long period of installation in an uncontrolled climate. Since many works from the same series have shown extensive shrinkage of the cow bladders, the artist had already developed a maintenance concept, which consists mainly of the replacement of cow bladders when shrinkage has progressed to an unacceptable degree determined by the artist. This would include torn edges,

losses and layer separation. The method of exchanging original with new material, although as a technique quite common in contemporary art, was challenged by our studio and a suitable alternative was researched extensively. The Decision-Making Model (1997/99, Foundation for the Conservation of Modern Art) was used to determine and evaluate a method that would sustain the artworks integrity. The artist was contacted and she provided us with detailed instructions about her "conservation procedure;" professionals from related fields and conservators with different areas of expertise (as an example, taxidermists and conservators from The American Museum of Natural History) were contacted. The original cow bladders in *Atrabiliarios* were sustained and the artwork was re-installed in a climate-controlled environment. The developed conservation method of the cow bladder will be explained step by step and discussed.

For the second artwork "still in the making," Ursula van Rydingsvard, a New York City based artist, contacted our studio with a simple question: how can one preserve cow guts in a way that they will not shrink and tear?

Two conservators from Contemporary Conservation visited the artist's studio, where her questions and artistic aims were presented and explained in great detail. This is an important step, as it is our goal to support her creative process without influencing her artistic ideas with aspects of conservation. The discussion led to contacting a number of professionals. Of particular interest was the preparation of seal intestines for the making of raincoats used in Inuit Culture. Various approaches were developed and tests were initiated, experimenting with fresh cow stomachs from a local food supplier. Although first results provide directions, the investigations are still ongoing. The approach and results, maybe even the artwork by Ursula von Rydingsvard, will be presented in the talk.

In conclusion, the challenges presented in the preservation of an already existing artwork and of a work in progress will be investigated and discussed. The complex assignment of both, the conservators and the artists, imply many aspects of careful assessment and step-by-step evaluation in each case.

Vibration Control During Museum Construction Projects

Arne P. Johnson, Principal, Wiss, Janney, Elstner Associates, Inc.; W. Robert Hannen, Engineer, Wiss, Janney, Elstner Associates, Inc.; and Frank Zuccari, Senior Paintings Conservator and Head of the Department of Conservation, Art Institute of Chicago

NOTE—This presentation will provide a summary of an article by the same title that has just been accepted for publication in the Journal of the American Institute for Conservation. In addition, the presentation will include practical examples, photographs, and data from the authors' involvement in the museum construction projects highlighted at the end of the published article.

Vibrations caused by heavy construction at museums are potentially harmful to museum buildings and artwork. Protection

of these objects calls for a reliable method of vibration control during construction projects. In this presentation, background information will be provided on vibrations and their effects on humans, buildings, and artwork. Then, conservative limits for protection of buildings and artwork from damage from vibrations during construction will be recommended. Research and examples will be cited that show: 1) most works of art in good condition have damage thresholds that are much higher than the limits recommended for construction vibrations; 2) vibrations to which art objects are exposed during transit are often much higher than the limits recommended for construction vibrations, without damage; 3) similar limits have been used during several previous museum construction projects, without damage; 4) humans can perceive much lower levels of vibration than the recommended limits, so it should be anticipated that vibrations at these levels will be noticeable to building occupants even though they are not damaging; and 5) even ambient (day-to-day background) vibrations in museums can approach the recommended limits, which reinforces the conservative nature of the limits.

The research and the authors' experience show that the greatest risks for damage to art objects during construction projects are from walking of unrestrained light objects on smooth surfaces; resonance of objects that have natural frequencies similar to steady-state construction vibrations like sheet pile

driving; and vibratory motion of extremely fragile objects or those with serious pre-existing weaknesses. Measures should be taken to protect against these unique risks.

Vibration control during museum construction projects has often been based on judgment and qualitative analysis. This presentation will outline a scientific methodology, based on available research and state-of-the-art technology, to protect the museum while not unduly constraining, encumbering or slowing the construction process. The key steps include preconstruction testing, selection of appropriate vibration criteria, planning for preconstruction collections movement, development of a project-specific vibration control specification, field trials and condition surveys, construction-phase vibration monitoring along predetermined safe lines, and stringent protocols should near-limit or over-limit events occur. The methodology has proven successful in recent construction projects at leading U.S. museums and is offered for the benefit of other museums undertaking similar work.

Two examples of large-scale implementation of the methodology will be described: the first involving three major construction projects at The Art Institute of Chicago from 2005 to 2009, and the second being the expansion of the Saint Louis Art Museum from 2009 to date. Both projects involved extensive preconstruction testing, vibration control development, and construction-phase vibration monitoring systems.

Breaking the Cycle: The Role of Monitoring in the Watts Towers Conservation Project

Blanka Kielb, Assistant Conservator, Los Angeles County Museum of Art; Sylvia Schweri-Dorsch, Associate Conservator, Watts Tower at Los Angeles County Museum of Art; Frank Preusser, Head, Research Laboratory at Los Angeles County Museum of Art

Since January 2011, the Los Angeles County Museum of Art (LACMA) has worked under contract to the City of Los Angeles on the conservation of the Watts Towers, a National Historic Landmark sculptural site. Created by Sabato Rodia between 1921 and 1954, the Towers include three towers, the tallest measuring 99.5 feet in height, and eight additional sculptures constructed of scrap iron covered in Portland cement and ornamented with scavenged glass and tile fragments, sea shells, stones, and other material. LACMA's mandate is to update the site's conservation and maintenance protocol through written guidance, as well as provide daily preservation maintenance.

Due in part to the non-traditional aspects of Rodia's construction method, the Towers are subject to deterioration including mortar cracking, loss of ornaments, and corrosion of the steel elements. Cracks often occur and reoccur in areas of past restoration. Past restorers often adopted a whole-scale approach involving removal of mortar shell and replacement of steel armature when corrosion was suspected to play the leading role. In order to better understand the various causes of deterioration, LACMA is engaged in monitoring on a variety of fronts, including thermal, vibration, and corrosion monitoring. Preliminary data indicate that the deterioration of the Towers is more complex than previously thought. Conservation materials currently being evaluated have been identified in view of requirements for flexibility and improved adhesion. Migrating corrosion inhibitors will also be evaluated. By utilizing amended mortars, elastomeric crack-fillers and adhesives better suited to the unique conditions of the Towers, it is hoped to minimize the need for more aggressive structural intervention in the future.

An Evaluation of the Conservation History of Chagall's *Les Quatre Saisons*

Jamie Clapper Morris, Associate, Wiss, Janney, Elsther Associates, Inc.; and Deborah Slaton, Principal, Wiss, Janney, Elsther Associates, Inc.

Les Quatre Saisons (The Four Seasons) mosaic by artist Marc Chagall, was created as a gift to the people of Chicago by the artist and constructed in 1974 with funding by the Prince Charitable Trust. The mosaic consists of tesserae placed on precast concrete panels, which are mounted on a cast in place concrete structure, and is approximately 70 feet long by 14 feet wide by 10 feet tall. The mosaic is located at Chase Tower Plaza (formerly First National Bank of Chicago Plaza) in Chicago, Illinois. Stewardship of the mosaic is overseen by a consortium of Chicago arts entities including the Art Institute of Chicago.

Due to its installation in an exterior environment and the materials and methods selected for its initial construction, the mosaic is highly susceptible to distress related to weather. Since its installation, several projects have been initiated to clean, repair, and monitor the mosaic. The first repair project commenced in 1988, fourteen years after the mosaic was installed, after extensive deterioration of the walls and original mosaic top surface was observed. At that time, large areas of the walls were restored and the top was replaced with granite panels. Following further deterioration observed in the 1990s, WJE conducted an investigation and laboratory studies, and developed the design of repairs implemented in 1993. In addition, a canopy featuring a glazed roof to allow light to enter the space below, and open sides to preserve the immediacy of the viewer experience, was constructed to protect the mosaic.

WJE has had an ongoing relationship with the mosaic since performing the assessment and repairs in the early 1990s, including vibration monitoring during repairs to the adjacent plaza and monitoring during the recent micro-abrasive cleaning of adjacent Chase Tower. Since completion of the 1993 repair program and construction of the protective canopy, only minor repairs and gentle cleaning have been required to the mosaic. Most recently, WJE conducted a condition assessment (2010) and performed cleaning the walls of the mosaic and the reinstallation of a few delaminated tesserae (2011).

This presentation will explore the original materials and methods of the mosaic's construction and the role of environmental and physical site conditions in the creation of early-forming distress conditions, as well as the results of repair methods used in the 1980s. The investigation approach and methods as well as the analytical methods used to develop the 1993 repairs will be discussed, along with the investigation findings and recommendations, and the techniques used in the recent repair program. It has been nearly twenty years since the last large-scale repair program, and the 2010-2011 condition assessment and repair program support the benefits of laboratory studies to guide the 1990s repairs, as well as the effectiveness of the protective canopy. The presentation will also address the monitoring efforts implemented to protect the mosaic since 1993.

Bringing Modern Back: Restoring 1930's Aluminum Finishes

Helen M. Thomas-Haney, Conservator, Jablonski Building Conservation; Xsusha Flandro, Senior Architectural Conservator, Jablonski Building Conservation

“Peer into the Future...ALCOA Aluminum is revealed a shining symbol of strength... lightweight... enduring beauty”

- 1931 ALCOA Advertisement

In the 1930s aluminum was hailed as the new wonder material capable of withstanding weathering and structural stresses. Aluminum was being used for a wide variety of materials including architectural features such as windows, spandrel panels

and decorative elements. ALCOA advertisements claimed that “Rain, hail, and snow fight Alcoa Aluminum and lose.”

In 1932, stamped cast and extruded aluminum was used to create the spandrel arch at the 4th Avenue station in Brooklyn. 4th Avenue is an elevated station on the BMT line of the New York City Transit System. The arch stretches across a four-lane street and stands approximately 30' tall. It is currently listed as a state historic landmark.

The restoration of the 1932 aluminum paneled spandrel arch proved that aluminum is not as weather resistant as originally advertised. The initial goal of the aluminum restoration was to remove over-paint from the aluminum and reapply finishes to match the original appearance in-situ. However, the lack information on aluminum restoration complicated the project. Years of poor maintenance, layers of paint, and inappropriate interventions lead to more deterioration than was anticipated.

The restoration started with a review of the original drawings, specifications, and photographs. The drawings noted that three different types of mechanical finishes were to be used on different elements of the façade—“satin,” “sand-blasted,” and “sand-blasted deplated.” Paint removal mock-ups as well as an examination of paint samples, confirmed that these finishes were indeed installed. However, corrosion and pitting of the aluminum surfaces beneath the paint required that the corrosion be removed prior to re-instating the finishes.

Little information on the restoration of architectural aluminum and aluminum finishes exists. Extensive research using digital archives as well as resources through AIC and APT were used to define satin and sand blasted finishes while deplated was not found in this search.

It was the discovery of an early trade book, *Aluminum in Architecture* (1932), which contained descriptions of different types of aluminum finishes, including “deplated” that provided the key to understanding these finishes. Deplating was the result of a process requiring the entire aluminum panel to be dipped in an electrically charged solution.

Cleaning the corrosion from the aluminum in situ became a challenge. Since blasting was rejected on grounds of containment, another method had to be found. Working with the contractor, another mechanical method was found using a rotary machine that would simulate a coarse “blasting,” but without the resulting debris. Although aluminum was advertised as being corrosion resistant, it does corrode. Coatings are required to prevent the reaction of the aluminum with the atmosphere. New coating materials were researched that would be easy to apply in the field and be compliant with VOC regulations.

When the aluminum spandrel arch was finally cleaned and refinished, it once again showed what ALCOA had advertised in the 1930's, “Aluminum is revealed a shining symbol of strength... lightweight... enduring beauty.”

Fifteen Shades of Grey...? Paint Color Analysis on the Eames House

Emily MacDonald-Korth, Associate Project Specialist, Getty Conservation Institute; Alan Phenix, Scientist, Getty Conservation Institute; Tom Learner, Senior Scientist, Getty Conservation Institute; Kyle Normandin, Senior Project Specialist, Getty Conservation Institute

“My interest in painting is the rediscovery of form through movement and balance and depth and light using this medium to recreate in a satisfying order my experiences of this world with a desire to increase our pleasure, expand our perceptions, and enrich our lives.”

—Ray Eames, *California Arts & Architecture*, September 1943

Built in 1949, the Eames House was the eighth in the Case Study House program published in the influential *Arts & Architecture* magazine, between 1945 and 1966. The Eames House, designed by Charles and Ray Eames, was not only an iconic and hugely influential work of modern architecture but it was the first steel framed prefabricated project built for the Case Study House program which promoted new technologically advanced models for mass housing, and for which there was huge demand during the postwar years.

The GCI is currently providing the necessary investigation and scientific analysis to understand the environmental and physical conditions affecting the site, house, and its contents. As part of this ongoing investigation, the GCI will study the building materiality and determine conservation approaches and techniques appropriate to the house.

During 2011-2012, the initial investigative stages of the Eames House conservation program included an analysis of the paint stratigraphy including in situ paint excavations on the exterior steel frame of the building on multiple elevations to correlate the various paint layers identified in cross sections through optical microscopy with a macroscopic window of each layer. The in situ excavations confirmed the layers found in the samples in nearly all cases. A series of samples were taken from the house paintwork for microscopical examination and chemical analysis, with particular focus on matters of stratigraphy and pigment composition insofar as those things informed an understanding of the history of painting of the building.

Additionally, samples were obtained (and analyzed) from seven painted reference plates and a series of old paint cans retained at the house including fragments of putty detached in the 1994 Northridge earthquake, which offered a terminal chronological reference point. Paint samples were prepared as polished cross-sections, examined and photographed by optical microscopy, and analyzed by ESEM-EDS for spatially-resolved elemental composition. Selected samples were analyzed for organic binder composition by pyrolysis-GCMS and FTIR-spectroscopy.

The samples from both the interior and exterior metalwork trim showed good evidence for repeated campaigns of puttying, priming and painting. The interior and exterior metalwork were treated quite differently in terms of the patterns of their

re-painting campaigns. In many instances, samples from the metalwork revealed complex stratigraphies consisting of many layers (putty, primer, paint); but these were often inconsistent across a specific group (i.e., interior metalwork; exterior metalwork). Organic binder analysis of the earliest paint layers indicated the presence of a synthetic (styrene-butadiene) rubber binder, again consistent with documentary evidence on the original decoration materials used.

Taken as a whole the paint analyses provided strong evidence that the earliest paint on the metal frame of the house was a distinctively-pigmented gray, which tallied with documentary reports of it being originally a “dark, warm gray,” rather than the black that it is now. A few of the samples examined included complex stratigraphies that illustrated the various repair campaigns to which the metalwork had been subjected since original construction.

Lights, Color, Action!: The Restoration of Color Fuses in Downtown Indianapolis

Caroline Sachay, Regional Fine Arts Officer, U.S. General Services Administration

One of the largest murals in the United States is located in downtown Indianapolis. Conceived in 1975 by renowned artist and graphic designer Milton Glaser (I [Heart] NY, logos for D.C. Comics, Brooklyn Brewery, and much more), the 27' x 672' artwork titled *Color Fuses* features graduating bands of vibrant color and a kinetic lighting element. Despite its scale, originality, and the prestige of its creator, the piece was virtually unknown for much of the past 37 years. The lighting program originally called for never materialized and a lack of treatment and attention resulted in a surface marred by fading and weathering.

An extensive restoration project undertaken by the U.S. General Services Administration in 2012 returned the surface to its original brilliance and, for the first time, established the lighting sequence that the artist intended.

Years of research and collaboration amongst a diverse team of professionals that included architects, conservators, painters, lighting designers, GSA Fine Arts staff and the artist were required to complete the project. The restored piece features a mix of familiar and cutting edge technologies which allow for unique viewing experiences during both day and evening hours throughout the year.

Created for the iconic Minton-Capehart Federal Building and located along Indianapolis's storied American Legion Mall, *Color Fuses* can now be fully appreciated as an important cultural destination for residents and visitors alike.

GSA Fine Arts Specialist Caroline Sachay will present a review of the project, locating it within the context of GSA's Art Program. Special attention will be paid to the original collaboration between Milton Glaser and architect Evans Woollen, the challenges faced by the restoration team, and the impact of the project on the building and surrounding urban landscape.

Shared Approaches for Conserving Modern Heritage

Panel Chair: Richard McCoy, Conservator of Objects & Variable Art, Indianapolis Museum of Art; Moderator: David Fixler, Principal, Einhorn Yaffee Prescott Architecture and Engineering, Inc.; The Miller House and Garden: Bradley Brooks, Director of Historic Resources and Tricia Gilson, Archives and Content Specialist; The Eames House, Case Study No. 8: Kyle Normandin, Senior Project Specialist, Getty Conservation Institute

This panel discussion will present two case studies that demonstrate interdisciplinary conservation and preservation strategies for two mid-century modern masterpieces. In addition to the four presenters, a discussant will contextualize the presentations within a broader framework of challenges encountered and shared approaches to conserving modern architecture.

The Miller House and Garden

The Miller House and Garden (1957), the Columbus, Indiana, residence of J. Irwin Miller and Xenia S. Miller, is a remarkably well-preserved masterpiece of modern design. A collaboration by architect Eero Saarinen, interior designer Alexander Girard, and landscape architect Dan Kiley, the property is among the most important mid-century homes in America.

The Indianapolis Museum of Art acquired the property in 2009 and determined that it would open the property to the public as a preservation project in substantially the same condition and configuration as when it was received. To aid in forming strategies for ongoing maintenance and preservation, the IMA is fortunate to have extensive archival records of the property's design, construction, and maintenance over many decades. In addition, some of the original construction contractors remain actively involved at the Miller House and Garden. Former employees constitute another source for information about the site. Using these historical resources in concert with its conservation department's involvement and oversight, the IMA continues to develop its conservation and maintenance approach to the property and its collections. The IMA continues to develop strategies for conservation projects inside the house and the exterior based on the archives and other shareholders.

The Eames House, Case Study House No. 8

Built in 1949, the Eames House was the eighth in the Case Study House program initiated by John Entenza, editor of the influential *Arts & Architecture* magazine, published between 1945 and 1966. The Eames House, designed by Charles and Ray Eames, was the first steel-framed, prefabricated project built for the Case Study House program which promoted new technologically advanced models for mass housing for which there was a huge demand in the immediate postwar years.

The Eames House Conservation Project, the first field project under the banner of Conserving Modern Architecture Initiative at the Getty Conservation Institute (GCI) focuses on this iconic and hugely influential work of modern architecture. The GCI is working in partnership with the Eames Foundation, together with consultant architects and conservators, to assist the Foundation to develop a long-term conservation management plan that embodies a sustainable approach to the care and conservation of the site, house, and contents including a maintenance program. Development of a conservation management plan will bring together historical documentary and oral evidence, physical analysis of the existing fabric, including knowledge on its performance, to inform a long-term strategy for the care and conservation of the house the valuable contents which are a testament to the Eames's lifestyle and interest in design. A well-known tool internationally, the conservation management plan will provide a model for the conservation of similar buildings from this era by demonstrating how thoughtful conservation can be applicable to modern buildings.

Ethics and Standards: Comparing the Practices of Architectural Conservation and Historic Architecture

Peyton Hall, Managing Principal, Historic Resources Group, LLC.

The historic architect practicing in the American context learns the Secretary of the Interior's canon: the Standards for the Treatment of Historic Properties, associated Guidelines, and Preservation Briefs. The American conservator follows the AIC's Code of Ethics and Guidance for Practice.

Conservation ethics imply a high standard of practice; the historic architect has no official criteria in that regard. However, architects do benefit from the Department of the Interior's continuing effort to explain and update their Standards. The National Park Service's Technical Preservation Services has specific guidelines for solving programmatic issues such as accessibility, as well as updated publications on how to repair historic masonry and design compatible additions to historic buildings.

This paper will first of all outline those aspects of the AIC's ethics that are not implicit in practice criteria for historic architects. Secondly, the paper will outline the types of Standards that exist for historic architecture, describe how they come to bear in a regulatory context, and present several examples of the application of those Standards to projects, systems, materials, and finishes in assessing conditions and specifying treatments for historic properties.

These different approaches, ethics and standards, apply for conservators and architects who work side by side on the same buildings and materials. Joint study of these different approaches can improve practice in both professions and lead to better treatment of cultural property.

The Emperor's New Clothes? Establishing National Standards for Masonry Cleaning

John A. Fidler, President & Chief Technical Officer, John Fidler Preservation Technology Inc

Large scale cleaning of masonry buildings is a common enough occurrence. But model protocols to characterize the substrates and soiling of facades are hard to find. Few countries seem to have adopted standardized codes of practice for masonry cleaning and even fewer have adequate published guidance on what can be a very complicated set of cleaning procedures for different materials and their sensitivities.

The author will discuss the context within which national cleaning standards are set and discuss the contractual, economic, technical and scientific reasons why cleaning procedures are implemented by architects and masonry contractors rather than by architectural conservators.

A Review of the Test Methods/Stain Reduction Techniques Used on the Smithsonian Natural History Museum, Washington, DC

Ellen Hagsten, Traditional & Sustainable Building; Richard Wolbers, Associate Professor, Coordinator of Science and Adjunct Paintings Conservator, Winterthur/University of Delaware

One of the challenges of specific stain reduction or removal from building facades that are either stone or masonry is in the rapid, accurate appraisal of the likely staining materials. Many times this is empirical, rather than analytical, and generally derived from contextual cues, rather than direct test methods. All too often, standard "formulas" for exterior washing are applied to specific cleaning problems, without benefit or careful tailoring of cleaning system to a specific problem. This paper will present a case history for the use of a diagnostic "test kit" of various cleaning reagents (chelators, acids, bases, buffers) in easily stored and transferred gel form to evaluate quickly the efficacy of any given reagent or condition to a specific staining material. In particular, this "kit" contains a low cost, easily read, colorimetric test for Fe in particular. Where iron is present, either in mineral form or as corrosion products, the removal of organic staining material in particular is difficult at best because of the extreme insolubility of these metal/organic materials.

To illustrate its application and use, a case history, the cleaning issues involved in the removal of staining materials from the façade of the Smithsonian Museum of Natural History in Washington, D.C., will be used as an example. A "gel-paste" format was used to create a tailored poulticing material. The poultice used in this context was made from low cost materials and was prepared with reagents that were indicated by the gel "test kit" to be most effective in this context. The construction of the poultice, the materials used in it, the rationale for

their inclusion, and the application method, will be discussed. Additionally, in presenting the evolution of the treatment from testing, to execution, we will include a discussion of the didactic opportunity it provided for introducing new materials and methods to building maintenance personnel.

Putting the Conservator in the Mix: Using the MCP to Formulate Cleaning Systems for Architecture

Chris Stavroudis, Conservator in Private Practice

Often the cleaning of historic building exteriors is specified in terms of a handful of commercial cleaning products.

While the Modular Cleaning Program (MCP) was designed from the perspective of paintings conservators, there is no reason that the system cannot be extended to allow rapid prototyping and testing of cleaning systems for the built heritage community.

The Modular Cleaning Program will be introduced with a focus on aqueous cleaning systems. Typical architectural cleaning systems will be examined and modeled with the MCP. The program will then be used to change parameters of the cleaning system in such a way that small batches of prototype cleaning systems could be mixed, tested and evaluated. It is hoped that such a system would give the conservator a more prominent role in selecting cleaning systems for buildings.

Input from the audience will be solicited to direct modifications to the MCP to facilitate formulating this type of a cleaning system.

Facade Cleaning: Managing Expectations

Deborah Slaton, Principal, Wiss, Janney, Elstner Associates, Inc.

The success of a facade cleaning project should be measured not only by how clean the building looks after the project has been completed, but also whether cleaning has been sufficiently gentle to avoid damaging the substrate. In fact, a building may appear strikingly clean and “like new” because it has been over-cleaned and damaged during the cleaning process. However, a facade cleaning project that has been sufficiently gentle to remove only a portion of soiling and staining may be considered a failure if the results are not clean enough to meet owner expectations.

Inappropriate and overly aggressive cleaning, with the wrong products or techniques, may permanently damage the substrate, as well as other building elements and site features. Depending on the cleaning system used, and the damage that may have occurred, over-cleaning can also result in increased repair and maintenance needs in the future. However, it may not be easy to define what constitutes damage in a cleaning project, or to convince the owner that damage has occurred.

Almost any cleaning system can result in damage to some substrates, if not properly tested, applied, and controlled. Some

fragile materials can be eroded by water cleaning, and the presence of even a very small amount of iron in the water used for cleaning and rinsing processes can result in staining on some substrates. Microabrasive cleaning systems require very careful control to provide appropriate results without damaging the surface. Chemical cleaners in particular can be subject to misuse; material safety data sheets (MSDS) provide information on chemicals that are hazardous to people rather than chemicals that may be hazardous to building substrates. Aggressive chemicals such as hydrofluoric and hydrochloric acid, which are present in many proprietary cleaning products, can damage facade components, mobilize staining, and are also hazardous to persons, animals, and the environment. Even less aggressive chemicals, such as organic acids contained in some proprietary cleaners, may react with certain minerals in masonry substrates and cause staining.

Although conservators and others in the preservation professions would agree that treatments that cause damage to the historic materials should not be used, once a building owner has seen a bright, clean, trial cleaning sample, how can we convince the owner that the cleaning method that resulted in a like-new appearance is not an appropriate solution? This presentation will examine a range of cleaning systems and potential effects on substrates, and consider possible approaches to guiding the building owner to an appropriate decision. Techniques for facilitating discussion and managing expectations include educating the client from the very beginning of the cleaning project; providing a range of trial samples to illustrate potential results (and avoiding trial samples with overly aggressive cleaners); being prepared to illustrate the effects of cleaning systems with examples and by microscopic evaluation before and after cleaning; and emphasizing the benefits of responsible cleaning and the positive aspects of a building that may be less clean—but is more sustainable for the future.

Where the Water Flows: Louis Kahn's Trenton Bath House

Anne Weber, Mills + Schoering Architects; John Canning, The John Canning Studios; Mary Jablonski, Jablonski Building Conservation

The Bath House and Day Camp Pavilions, designed by Louis I. Kahn circa 1954–1957 for the Trenton Jewish Community Center (JCC), are locally and nationally significant. They mark a turning point in Kahn's career, representing a new way of defining space, and reflect an important stylistic advancement in the way modernist principles were infused with the lessons of the past. The Bath House and Day Camp were listed on the New Jersey and National Registers in 1984, prior to reaching fifty years of age, reflecting their extreme significance.

In this interactive session, a diverse panel will review the preservation of this aging modernist facility and the recovery of its historic integrity, which required thoughtful attention to the buildings and landscape, including an abstract mural by Kahn at the entry to one of the pavilions. The mission of the

project was threefold: to implement repair and restoration of the Bath House for ongoing use as a community center and pool; to reconstruct, based upon HABS-level documentation, the Day Camp Pavilions; and to interpret the site and improve site access with a new snack bar and new landscape features intended by Kahn but never completed. The preservation objectives included addressing significant architectural challenges with materials, detailing and original construction methods. The project included the restoration of several features designed but lost to time, in particular Kahn's unique abstract entrance mural.

According to oral history, Louis I. Kahn and an assistant arrived at the site of the soon-to-be-completed Bath House and began painting a mural adjacent to the entrance that featured geometric forms reminiscent of waves and fish on the textured concrete block wall. Little information about the mural's creation beyond an initial sketch and an early photograph survive.

Half of the mural is protected by the eaves of the pyramidal roof, while the other half is exposed. An early photograph shows visible deterioration of the mural where water runoff from the roof flowed down the surface of the mural, washing paint away. It is therefore likely that significant losses of paint due to water damage resulted in the mural being overpainted fairly early in its history.

Canning Studios and Jablonski Building Conservation were the team selected to focus on the mural. Prior to restoration of the bathhouses, a conditions assessment and finishes investigation was performed for the mural and its substrate, the concrete block. A treatment plan for the restoration of the mural considered several options. The degree of deterioration of the original paint and the extensive losses not just of paint but the concrete block determined the final option selected.

This significant work of the modern era used inexpensive materials in creative ways absent the constraints of time-tested traditional detailing, which resulted in inherent durability and maintenance issues. These challenges were inherited by the conservation team who, at the same time was seeking to preserve the ideas central to the architectural and artistic significance of Kahn's work. This is a unique story about a common challenge often faced in conserving the contemporary.

ARCHITECTURE—EMERGING CONSERVATORS RESEARCH SESSION

Nondestructive Testing Monitoring of Wooden Native American Pyramidal Structures

Researcher: Michael Shoriak, University of Pennsylvania; Thesis Advisor: Michael Henry; Project Directors: Frank Matero, John Hinchman

This research addresses the need for a non-contact, non-destructive methodology for monitoring changes in configuration and material condition of wooden structures constructed in Grand Canyon National Park by the Navajo and Havasupai Native American Tribes. Beginning in the late 19th century, Navajo and Havasupai family groups lived in seasonal community camps along the south rim of the Grand Canyon. During the 1950s, the National Park Service relocated both tribes from the Grand Canyon National Park leaving behind many different types of abandoned Native American wooden structures in settlement camps throughout the Park landscape. As part of this research, two methods have been investigated and developed for monitoring the structural engagement and fixity and condition of these structures. First, a photographic survey method is described that provides a technique to detect changes in the engagement and fixity of the wooden structural forked pole primary members. Second, Infrared Thermography is evaluated as a potential method to detect core deterioration in the wood forked pole primary members. This research presents the results of the proposed methods using models and sample materials under controlled interior conditions as well as the results of field testing in July 2012.

Evaluation of Consolidation Treatments for the San José Convento Column, San Antonio Missions National Historic Park, San Antonio, Texas

Kalen McNabb, University of Pennsylvania; Frank Matero, Professor of Architecture, Director, The Architectural Conservation laboratory, School of Design, University of Pennsylvania

The retreatment of previously consolidated stone has become an increasingly common occurrence and an important area of research in the field of architectural conservation. The San José Convento Column within the San Antonio Missions National Historical Park in San Antonio, Texas, is a prime example for consideration. Initially analyzed, tested, and treated in 1993 by the Architectural Conservation Laboratory at the University of Pennsylvania, the column today is now in need of additional treatment. Recent analysis has determined that while the 1993 treatment had been largely successful in stabilizing the active

flaking and decohesion of the stone surface, microcracks originally present have advanced and original surface detachment has worsened, largely due to clay swelling deterioration. It is likely that this deterioration mechanism existed in 1993, but was less visible due to the extent of detachment and flaking. Over the past 19 years, further research has been performed on modified ethyl silicates that inhibit clay swelling while restoring the grain-to-grain cohesion of argillaceous stone. In order to determine the most appropriate consolidation treatment for the column, several consolidants including a modified ethyl silicate were tested to determine the most appropriate method for in situ application.

Research undertaken for this study has focused upon the continuing deterioration of the column due to swelling of clays inherent within the stone. Local argillaceous limestone samples similar to the column were taken from the perimeter wall of the mission and previously studied during the initial 1993 treatment tests. These samples have been used for the purposes of this research. These samples, consisting of 2" square cubes and 2 x 2 x 0.2" thick coupons were treated with four different consolidants including a pre-treatment with an anti-swelling agent. Untreated and treated samples were then subjected to physico-mechanical testing to evaluate the effect of these treatments on stone strength, water absorption, permeability, and wet-dry cycling. Bulk samples taken from the column were analyzed through XRD to identify the swelling clay mineral composition of the stone. New methods of assessing the consolidation effects involving resistance drill testing were used to measure depth of penetration and efficacy of application on a large boulder recovered from the site. Durability of the stone was determined by wet/dry cycling coupled with SEM-EDS analysis to visualize the interaction of the consolidants with clay particles within the stone. The information and data obtained from this study will inform the future retreatment of the column needed to resolve the microcracking visible today. The conclusions drawn from this work will also contribute to the broader issues of retreatment and life cycle of treatments on previously consolidated stone.

Learning from the Bastrop Wildfire: Effects of Wildfire on Historic Material

Miriam Tworek-Hofsetter, University of Texas at Austin

On September 4, 2011, the most destructive wildfire in Texas history ignited in Bastrop County and continued to burn for more than a month afterwards. By the end, 720 acres were burned and 1,723 structures destroyed. One of the casualties of the fire was Bastrop State Park—a park founded in 1933, and developed by companies of the Civilian Conservation Corps (CCC) as part of Franklin Delano Roosevelt's New Deal. CCC constructions in the park include day use buildings (e.g. refectory, bath house), a set of maintenance buildings, and cabins as well as smaller structures including two overlooks and several culverts built into the park's main road. All are built in the National Park Service Rustic style, and demonstrate a singular commitment

to craftsmanship. In the Bastrop Complex fire—while wildland firefighters managed under great duress to coax the fire away from the cabins and day use buildings—both overlooks and all culverts were burned. The overlooks, load-bearing masonry structures, which lost their wooden roofs in the fire and suffered unknown structural damage, have since been re-roofed and the culverts are deteriorating with the post-fire effects of increased vegetation and soil erosion.

This paper will explore two aspects of cultural resources affected by the Bastrop fire: first, the potential long term effects of fire damage on sandstone of Bastrop park structures and second, suggestions for preventative measures to protect sandstone in the event of future fires. While stone is not readily combustible, it can be damaged by fire both superficially with color change and spalling, and structurally with weakened compressive strength. In a study of sandstone, Monika Hajpal, of the Laboratory of Building Physics at Budapest University of Technology and Economics, found that burned sandstone will gain porosity and lose density—a fundamental material change that can weaken the stone's ability to support weight. This paper will give results of testing to determine the condition of structures currently, and how they may be weakened again in future events.

Preventative measures that park staff can use in preparing for the next wildfire include increased defensible space, and fire retardants. Increased and regular pruning of bushes and trees around the cabins has both positive and negative effects for the CCC buildings: defensible space is a proven measure in fire fighting and would save precious time and energy for fire fighters in the next wildfire event. Opposed to this is the original design intention of CCC architects, which subordinated structures to their environment, making them appear as part of natural features. Bastrop fire managers also did not use fire retardants on cultural resources, and this paper will present any deleterious effects of retardants on Bastrop materials and possible cleaning methods.

Protecting UT Landmarks: an Evaluation of Graffiti Control

Sarah Hunter, University of Texas at Austin

Graffiti has been a growing concern in public spaces. College campuses often serve as unfortunate recipients of this form of vandalism. With growing concern for the protection of its art collection, the University of Texas Landmarks public art program is developing a comprehensive plan to protect its artworks. The Landmarks program was launched in 2008 to cultivate a collection of public art for the University of Texas at Austin. Its priorities are to beautify the main campus while developing a sense of community and civic engagement. One of the first initiatives of the program brought 28 modern sculptures from the Metropolitan Museum of Art in New York City to the university. As its own collection grows, UT Landmarks wants to review methods for controlling graffiti. In collaboration with the UT

Architectural Conservation Laboratory; this project will evaluate techniques for anti-graffiti treatments on a Sol Lewitt outdoor sculpture.

Through the Landmarks program, UT acquired, Sol Lewitt's *Circle with Towers* from the Madison Square Park Conservancy in New York in 2011. *Circle with Towers* will be erected at the entrance of the new Dell Computer Science Hall and the Bill and Melinda Gates Science Complex designed by Pelli Clarke Pelli Architects. As part of a campus wide initiative to transform the East Mall into a major axis, the Science Complex and Lewitt sculpture will be located in the center of the campus. Designed by Peter Walker Partners Landscape Architects, the campus transformation will feature numerous art projects. Each public artwork will be viewed by thousands of people on a daily basis and will subject the collection to both applause and unforeseen hazards.

Lewitt's sculpture forms a 25 foot diameter ring of geometric forms. The structure is composed of Westbrook Concrete Block Company's Decro-Face Concrete Masonry Unit and is porous. All of the blocks have a water repellent admixture that is water-borne and clear. Both sacrificial and non-sacrificial anti-graffiti treatments will be tested in this evaluation. Sacrificial treatments are used for their minimal effects on the appearance of the substrate and are removed along with the graffiti once an episode occurs. Non-sacrificial treatments last for several graffiti episodes and are cleaned with chemical graffiti removers after an episode.

The process of treatment evaluation will include appearance and performance evaluation. After application of the anti-graffiti treatment an initial appearance evaluation will be completed to note immediate alterations in color and gloss. After the curing period is complete, a second appearance evaluation will be carried out. After successful appearance evaluation, the treated substrate will undergo performance evaluation. For the selected treatments, multiple types of graffiti will be applied to the surface. The graffiti will then be subsequently removed with the graffiti removal materials and methods recommended by the manufacturer. Based on the results of this evaluation, the "Circle with Towers" sculpture will be treated with an anti-graffiti coating. The results will serve as a model for future applications on porous substrates or comparable materials at the University of Texas at Austin.

Deformation and Disintegration of North American Marbles as a Result of Thermal Stress

Charles Thompson, Columbia University; Advisor: George Wheeler, Columbia University, and the Metropolitan Museum of Art

Stone, especially marble, has been a building material since the dawn of civilization. As technologies and tastes have changed over time, so has its use. During the middle of the 20th century thin panels of marble, ranging from 20-50 mm, started to appear

as exterior façade cladding on structures around the world. One of the inherent risks involved with this construction method is the potential for thermal deformation.

Marble, geologically speaking, is composed of calcite, dolomite, or a combination of the two. While both are similar in composition, they often perform very differently in response to external stimuli such as thermal cycling. In fact, deformation and disintegration instigated by thermal expansion and contraction differ greatly between specific marble types. The extent of which is completely dependent on the constituent mineralogy and physical characteristics such as grain size, boundary type, and orientation.

In 2000 the EU commissioned a collection of scientists, architects, and engineers working under the acronym TEAM (Testing and Assessment of Marble and Limestone) to create a report detailing the mechanisms behind thermal deformation potential as well as to develop standards for differentiating between marble that is susceptible to bowing and marble that is not. For obvious reasons the report largely focused on marbles originating from Europe. Little extensive scientific analysis of the effects of repeated thermal cycles on North American marbles, more specifically Tuckahoe, Colorado, Vermont, Alabama, and Georgia marbles, has been published.

Over the course of several months, disk samples from each marble type, approximately 40 mm in diameter and of varying thicknesses, will be subjected to repetitive heating and cooling cycles via a QUV accelerated weathering apparatus in both wet and dry conditions. Both before and after the samples are subjected to thermal cycling they will be measured in three directional planes (X, Y, and Z), tested for biaxial flexure strength and examined through petrographic analysis.

Considering these marble types vary greatly in both physical characteristics as well as mineralogical composition, the potential for thermal deformation and disintegration between them could likely be just as dissimilar.

In Defense of Natural Cement: Concrete Technology at Fort Totten, New York

Richard M. Lowry, Columbia University; Professor Norman R. Weiss

The U.S. Civil War had shown that fortified masonry structures were effectively obsolete with the advent of rifled cannon fire. Therefore, during the 1870s, the U.S. Military sought improved materials and defensive systems. Concrete was one of these materials, and, combined with reinforced steel rods and earthen embankments; it formed the backbone of the Endicott-Taft Period of Coastal Defensive Works in the United States (1885-1914).

At Fort Totten in Queens, New York, a series of concrete defensive works began in 1870, to replace a masonry fortification begun in 1859, but abandoned in 1867. These included a vehicular munitions tunnel, numerous torpedo and munitions magazines, and finally a series of Endicott batteries. Natural

cement was used initially in the 1870s, primarily because it was less expensive than Portland cement. However, reported problems of deterioration signaled the change to Portland cement, and then reinforced Portland cement concrete in the 1890s. Interestingly, the testing of concrete on site was facilitated by the construction of a cement works and the preparation of aggregate on site.

The objectives of this project will be to identify the different types of cast concrete used in the fortifications of Fort Totten, as well as to identify the cement binders, aggregate, and mix proportions. The qualitative differences in the types of concrete used in the fortifications will also be examined, in order to see if the complaints about the natural cement concrete were justified, and whether this was due to the cement itself or the mixture. Furthermore, the project will attempt to determine how much deterioration of the concrete and corrosion of the rebar have occurred since they were built, given their coastal location, and whether there any traces of Alkali Silica Reaction is present. Core samples (3½ inch diameter) will be taken from selected structures, and a variety of testing methods will be employed for this project, include X-Ray diffraction, compressive strength tests, and thin section petrography.

The project will also examine the on-site methods of concrete manufacture, focusing on the cement works and the aggregate crushing. These will be documented primarily using the records of the US Army Corps of Engineers at the National Archives. Finally, the project will try to determine whether the lessons learned about the use and manufacture of concrete at Fort Totten were implemented at other coastal fortifications.

This project will form the basis of a Masters Research Thesis at Columbia University, under Professor Norman R. Weiss, and is facilitated by the Director of Preservation at the New York City Parks Department. In addition, laboratory and sampling equipment will be supplied by John Walsh of Highbridge Materials Consulting.

Impact of Mineralogy, Texture and Fabric of Sandstone Quarried in Canada on Deterioration of Central Park Structures

Mayank Patel, Columbia University

The gray- to tan-colored sandstone used for the construction of the Bethesda Terrace and several bridges and arches inside Central Park, NY, displays varying weathering behavior when exposed to the same environmental conditions. This group of sandstone often referred to as New Brunswick or Wallace sandstone comes from various quarries in Canada. The aim of this graduate thesis is to understand how different modes of decay observed on various structures relate to sandstone's mineralogy, texture and fabric; and also decide if weathering is dependent on sandstone's source and

utilization. This research will be completed by April 2013.

Using polarizing light microscopy, X-ray diffraction and scanning electron microscopy, I will be fully characterizing the sandstone by determining its physical and mineralogical composition. This will allow me to compare and contrast between deteriorated, undeteriorated and new samples; see differences between sandstone from different quarries; and understand how a particular characteristic influences sandstone's specific weathering behavior.

I will also be performing hygric dilation measurements to calculate stresses produced during wetting and drying cycles as well as degree to which samples swell, to understand swelling stress in magnitude to the plane and perpendicular to the bedding, and to evaluate swelling stress in different solvents.

Does Size Matter? Comparing the Alpha-P and the Hyperion for FTIR Paint Analysis

Brooke Young, Columbia University

In art and architectural conservation since the 1970s, Infrared Spectroscopy is often used to analyze historic pigments and their media. Fourier Transform Infrared (FTIR) was introduced in the 1980s, followed quickly by the development of the Infrared Microscope. Because the configuration of instruments costs over \$100,000 with testing samples priced at \$100, it is often cost prohibitive for many conservators, consultants and scientists. Recently, a less expensive and smaller FTIR instrument was introduced. At \$15,000, the Bruker Alpha-P presents a much more approachable cost.

In my thesis I wish to compare the results of the pigment and media analysis made with the Alpha-P, located at the institute of Fine Arts to those made on the much larger and more expensive Hyperion FTIR microscope in the Metropolitan Museum's Objects Conservation Laboratory. In addition to investigating the accuracy of the Alpha-P's results, I would also like to discern what the smallest sample size an operator may use before significantly altering the results. There is currently no published information available as to whether this machine performs to the same standards and levels as the larger FTIR microscopy with regard to pigment and media analysis. Because the Alpha-P generally analyses large samples, it may be better applied to architectural pigment testing because of the availability of a more invasive paint sampling than permitted in the world of art conservation. Should this test perform and produce comparable, if not better, results, then the conservation world may find pigment testing more cost effective and easier to execute. In addition to comparing and contrasting the performances of the aforementioned equipment, I would also like to begin to compile library of architectural pigments in media for the Infrared and Ramen Users Group (IRUG) as no such compilation has yet been made available.

Splintered: The History, Structure, and Conservation of American Scaleboard Bindings

Renée Wolcott, Andrew W. Mellon Fellow, Conservation Center for Art and Historic Artifacts

The study of historical bookbindings can yield important information about traditional craft practices, the development of the book trade, and trends in readership. Quintessentially American scaleboard bindings—which feature thin, planed wooden boards—are of particular interest because so little is known about their origins and usage in colonial America or the extent of their survival in today’s research libraries.

This study identified 85 early American scaleboard bindings containing imprints from 1686 to 1833. The majority of the examined books were small, with horizontal-grain, ring-porous scaleboards and stabbed bindings. In nine bindings, the boards were identified as ash, a wood that has not been traditionally associated with bookbinding. Although most boards were split or radially cut, others were tangentially cut, suggesting that scaleboard did not have a single source such as the shingle industry. Simple full-leather bindings prevailed until the 1790s; quarter-leather bindings with paper sides dominated thereafter.

The study group also included bindings in full canvas, full paper, and full printed paper over quarter-bound boards. The majority of books printed prior to 1760 originated in Boston, while the majority of those printed thereafter were from New York, Philadelphia, and towns scattered across New England. More than 50 percent of the works bound in scaleboard were theological texts or schoolbooks, but the variety in content increased dramatically over the study period. Books in later decades also contained poetry, advice, etiquette, literature, and trade information; sewn binding structures, whether on raised or recessed cords, were more common on these less ephemeral texts. In addition, complex endsheet structures with board linings as well as pastedowns were observed only on sewn bindings between 1781 and 1796. Although the abbreviated binding structures placed the books at risk of textual loss, and the thin wooden boards were susceptible to chipping, splitting, and breakage, most of the examined bindings were intact. Because of their historical value, damaged scaleboard bindings should be preserved through proper housing and careful handling rather than extensive conservation treatment. Working with librarians to identify and document such bindings will spur scholarly research and ensure appropriate care for these unassuming but important books.

Conservation of Dieter Roth’s *Snow*

Brenna Campbell, Andrew W. Mellon Fellow in Conservation, The Museum of Modern Art; Scott Gerson, Associate Paper Conservator, The Museum of Modern Art; Erika Mosier, Paper Conservator, The Museum of Modern Art

Throughout his career, Swiss-German artist Dieter Roth

employed the book format as a key element of his work. Defining “book” as “a community of like-minded things,” Roth stretched and challenged conventional ideas about the nature of artists’ books, employing new formats and techniques to expand the book beyond its traditional boundaries.

In 1964, Roth began a residency at the Philadelphia Museum College of Art, with the intention of creating a limited-edition artist’s book. Over the course of three months, he produced about 6,000 drawings, prints, photographs, and notes, binding several hundred of them into a volume which he intended to photograph and reprint as a paperback. The ill-fated edition was never produced. In the 1970s, Roth constructed a table and two chairs to house and display the book, which he called *Snow*.

Since its acquisition by The Museum of Modern Art in 1998, *Snow* has been exhibited a handful of times, always with the album lying open on the table between the two chairs, and a small number of works from the book removed and hung, framed, on the wall. The work’s complexity and its poor condition have limited the ways in which it can be shown. An exhibition opening in February 2013 provided an opportunity to gain a deeper understanding of *Snow*, employing conservation treatment, scientific analysis, and digital imaging of the work to change and enhance the ways that viewers and scholars can access, interpret, and enjoy one of Dieter Roth’s most unique and important book projects.

Flip, Flap, and Crack: The Conservation of 400 Years of Anatomical Flap Books

Meg Brown, Conservator, Duke University

Anatomical flap books refer to a genre of 2-dimensional paper objects that contain multiple flaps of paper that as lifted reveal images of the many layers of human anatomy. The History of Medicine Collection (HOM) in the Rubenstein Library of Duke University contains a renown, unique, and fragile collection of these extraordinary materials. Considered by some scholars to be pre-cursors to the modern pop-up book, they are inherently vulnerable because their multiple small parts must be handled in order to fully experience the content. This HOM collection is particularly fragile as it contains materials dating from the 16th century with very small but stable pieces, to the 20th century with some brittle materials and acidic adhesives.

These materials see a great deal of “use.” Some of these volumes are displayed in show-and-tell sessions for educational purposes at the university, and In the spring of 2011 many of these volumes were placed on display in the library’s gallery for 3 months. Duke University Library prides itself on making their materials fully available to the university community, external scholars and the general public; anyone can come to use these volumes and flip through even the most fragile anatomical specimens.

The curator of the HOM collection has been integral in keeping an open communication with the conservation

department, and through the past 2 years we worked together to prepare the items for display (including photographing many pages and creating videos for the exhibit), to properly display the items, and after the exhibition, to properly treat and house those items that needed attention. This paper will discuss methodology of special mounts for exhibit, special housings for a wide variety of “pieces” that often accompany or are a part of these works, as well as discussions of multiple treatments completed on the items.

Most of the early material from the 16th and 17th centuries was straight forward to treat, as the paper and adhesives were still in excellent condition; it was the modern material, especially from the 19th and 20th centuries that proved to be challenging. The newer flap anatomies were riddled with bad adhesives, brittle paper, and shoddy workmanship. Treatment of these materials required conversations with curators, compromises from conservation, and open-mindedness all around. This paper is appropriate for the 2013 AIC session as it deals with contemporary use issues, contemporary objects, and contemporary techniques.

A Technical Study and Conservation Project of Roy Lichtenstein’s Screenprint on Plastic *Sandwich and Soda*, 1964

Marion Verborg, Craigen W. Bowen Paper Conservation Fellow, Straus Center for Conservation and Technical Studies, Harvard Art Museums

This case-study focuses on the technical study and conservation treatment of three impressions of Lichtenstein’s blue and red ink screenprint on clear plastic, *Sandwich and Soda*, 1964. Those prints are part of the portfolio *X + X (Ten Works by Ten Painters)*, published by The Wadsworth Athenaeum, Hartford, Connecticut; 500 portfolios were printed.

In this study, the three prints owned by the Harvard Art Museums were examined and analyzed to better understand the technique, history and degradation process. Regarding the condition of those prints, two types of pressure-sensitive tapes were attached on the ink layer of two of the three prints, probably to hinge the artworks prior to its acquisition by the Harvard Art Museums. A previous attempt to test the sensitivity of the ink caused some visible damage, which prompted the need for more information about the materials before coming up with the appropriate conservation techniques. The outcome of the scientific analysis of the plastic support, pigments (red and blue) and tapes (carrier and adhesive) using GCMS, FTIR, Raman Spectrometry and LDI-MS (Laser Desorption Ionization Mass Spectrometry) increased the understanding of the artwork and its current condition and allowed for appropriate treatment choices to be devised and executed.

Results: the plastic support is made of polystyrene, the ink binder is made of a variety of polystyrenes, one of the tapes is made of cellulosic material and the other tape (carrier and adhesive) is a PVA. This scientific research and conservation project included mock-ups on which to test appropriate tape removal techniques (heat, solvents, mechanical), the treatment to remove those tapes

and reduce the adhesive residues and suggestions for better housing, hinging system and proper storage environment.

Other objects by Lichtenstein on unusual supports will be examined before the AIC 41st Annual Meeting in an attempt to contextualize *Sandwich and Soda* within the larger Pop Art Movement.

Treatment and Housing Techniques for Pastel Paintings on Paper—Case Studies

Soyeon Choi, Senior Paper Conservator at the Conservation Center for Art and Historic Artifacts; Jessica Makin, Manager of Housing and Framing Services at the Conservation Center for Art and Historic Artifacts

Pastel paintings mounted on a wooden stretcher are vulnerable to tears and punctures caused by accidents or exerted tension under fluctuating environmental conditions. On the other hand, pastel paintings adhered to paperboard give rise to different condition problems associated mostly with warping or brittleness of the paperboard. In both cases, works that have received poor care frequently require treatment of scratches, abrasions, mold damage, and water damage. Here, we will engage in a comparative study of pastels on wooden stretcher and paperboard, addressing both treatment and housing issues involved in each.

In the first part of this presentation, treatment techniques for dealing with pastel paintings mounted on wooden stretchers will be discussed, with examples of pastel portraits by American folk artist Micah Williams (1782-1837). Williams’ original pastel portraits are typically executed on wove or laid paper support, glued onto a wooden stretcher, and accompanied by a loose lining(s) of local, period specific newspaper. The discussion will include surface cleaning using the tip of a kneaded eraser, mending tears with Klucel-G pre-coated mulberry paper, dealing with sprung-open tears or tears that are not reachable from underneath, and various in-painting techniques using ground pigment, grated soft pastel, and pastel pencil. Next, techniques for working with pastel paintings adhered on paperboards will be discussed, with examples of Micah Williams’ pastels that were badly modified by poor treatment in the past, as well as other pastels by Edgar Degas (1834-1917) in their original board mounted format. Due to the soft, friable nature of pastel media, removal of the backing or flattening the secondary paperboard is rarely feasible. Treatment is thus typically limited to problems independent of the secondary support.

In the second half of this talk, housing designs will be discussed which have been employed to safely enclose pastels on paper in three different formats: unmounted, mounted on paperboard, and mounted on wooden stretchers. These housing designs take into account the unique nature of the pastel media, the character of the support, and the concern for an optimal preservation environment. Using the Micah Williams pastels and the Degas painting as examples, we will look at options for glazing, mats, spacers, and the use of a Marvelseal® package, to

provide a supportive, physically stable, and low stress environment inside the frame. These housings have been used as a preventive measure against many of the condition issues that arise from the handling, storage, and display of these vulnerable paintings.

The Materials, Techniques, and Conservation Challenges of Richard Serra's Oil Stick Prints

Im Chan, Andrew W. Mellon Fellow in Paper Conservation, National Gallery of Art, Washington DC

The Gemini G.E.L. (Graphic Editions Limited) Archives at The National Gallery of Art, established in 1981, holds an example from each of Gemini's published editions. The Archives includes rare proofs, documentation notes, working materials, and photographs published by the Los Angeles, California workshop. Of the more than 1700 works in the Archives, twenty-one are screenprints made with oil stick by Richard Serra (b. 1939) between 1985 and 1991.

Richard Serra's large-scale prints, with their densely layered, rich textural surfaces expand the boundaries of traditional screenprinting techniques. Each of the images begin with a traditional screenprint in black ink. Subsequent layers incorporate oil stick, the generic name for a medium (often called Paintstick, the Shiva brand of Jack Richeson & Co.) composed of pigment, linseed oil and melted wax, and molded into large sticks.

The printers at Gemini, working with Serra, manipulate the medium by heating the oil sticks, adding additional linseed oil and casting the mixture into large bricks. Multiple layers of oil stick are pushed through a screen onto the original keyprint. The screenprints are created on a variety of papers—Japanese and western, machine and handmade.

Due to their large format and experimental technique, these works are often difficult to store, handle, and display. The prints exhibit a variety of condition problems, including non-drying, soft, tacky 'inks' and textured surfaces that attract lint and dust. The surfaces are vulnerable to abrasions and deformations, especially during handling. Some prints have white, hazy deposits that develop when free fatty acids migrate out of the oil paint and deposit on the upper layers of the image. The white efflorescence disfigures the prints' velvety black surface.

This research includes a survey and visual examination of Serra's oil stick screenprints and drawings from Gemini G.E.L., private collections, and museums. The condition of the works and storage methods were examined in an attempt to understand the relationship between the storage conditions and the formation of efflorescence. Scientific analysis, including gas chromatography-mass spectroscopy (GC-MS), was performed on samples of oil stick to characterize the media and identify efflorescence. The information gained from this research will inform the preservation and conservation needs of these works, and to develop protocols for optimum storage and treatment.

Archives Conservation Discussion Group— Is it Real? The Value and Ethics of Using Surrogates

Moderators: Cher Schneider, Juanita J. and Robert E. Simpson Senior Conservator, University of Illinois Library; Tonia Grafakos, Conservation Librarian, Northwestern University

This Archives Conservation Discussion Group (ACDG) will hold a discussion delving into the issues, uses, and needs of surrogacy in collections. The goal is to engage the panelists and audience in a true discussion.

Discussion Topics

- The Pros /Cons of Surrogate Use in Exhibitions
- Value of Original
- How do Surrogates Affect the User Experience?
- Do Surrogates Mitigate the Damage of the Original?
- Use of Surrogates in Personal Collections
- Conserving and Restoring Surrogates, Where Does it End?
- Creating Processes for Surrogates
- Challenges of Digital Surrogates

The demands on physical collections are growing as interest in unique collections increases. These demands are a concern to the conservation and preservation community. Surrogates are often suggested in order to mitigate damage and exposure of the physical objects. This solution is a controversial topic. Some have embraced this practice while others refuse to make the switch. Which side of the fence are you on? Please attend and voice your opinions and questions in this open discussion.

Art on Paper Discussion Group— Making Terminology Meaningful: Guiding the Description of Media for Works of Art on Paper

Nancy Ash, Senior Conservator of Works of Art on Paper, Philadelphia Museum of Art; Scott Homolka, Associate Conservator of Works of Art on Paper, Philadelphia Museum of Art; Stephanie Lussier, Consultant and Project Conservator, Philadelphia Museum of Art

Anyone who studies exhibition wall labels has observed the variation in the descriptions of materials and techniques in works of art on paper, which can be dramatic both in presentation and degree of accuracy even within a single institution. Access to such information through collections databases and websites makes the dissemination of accurate and consistent descriptions increasingly important and highlights the need for a more coordinated, cross-institutional approach. The inaugural session of the Art on Paper Discussion Group (APDG) will focus on this issue.

Conservators' specialized knowledge and their experience in examining and identifying materials in works of art gives them the unique ability to interpret and present information

about artists' materials and techniques. Their experience also makes them well-suited, in discussion with curators and cataloguers, to help address issues of how to enter the information into collections management systems and how to save it in a detailed format that can be edited or abbreviated for specialized uses (such as wall labels), possibly by defining separate fields for different levels of detail.

The issue of providing accurate, appropriate and consistent descriptive terminology, motivated conservators at the Philadelphia Museum of Art to initiate a Media Terminology Project, supported in-part by an IMLS 21st-Century Museum Professionals Grant and in collaboration with the project's working group members who represent museums across the country. The project began in November 2011—compiling, reviewing and evaluating existing materials descriptions and guidelines—activities that provided the foundation for drafting guidelines for describing materials and techniques in works on paper and a system for entering the information in collections information systems. Comprehensive supporting documents (glossaries, timelines, and materials hierarchies) also were created to facilitate consistency in recording observations made about materials and techniques.

This project's overarching goal is to enhance conservators' ability to communicate their knowledge about materials and techniques in order to provide allied professionals with consistent, understandable and agreed upon language for describing works on paper. This in turn will benefit the public by providing clearer, more informative descriptions in catalogues, exhibition wall labels and on the Web. The end result will be the development of a written guide to be shared online through the AIC Book and Paper Group Paper Conservation Catalog Wiki and other venues.

We hope to engage the wider conservation community in helping to develop the guidelines. To that end, during this year's APDG session the PMA project conservators and working group members will present the guidelines in their current draft form. They will highlight some of the more complex issues involved in the description of works on paper as well as data entry. Working group members then will lead break-out sessions focused on specific issues to receive contributions and critical feedback from the conservation community to help in the development of the guidelines and assess their effectiveness.

Two New Techniques for Loss Compensation In Art on Paper: Integration of Surface Losses Using Textile Fibers and The Use of Sprayed Cellulose Powder To Minimize Foxing and Other Discoloration

Elissa O'Loughlin, Senior Conservator, Walters Art Museum; Stephanie Jewell, Assistant Paper Conservator, Balboa Art Conservation Center

The integration of losses to the media in works of art on paper has traditionally been done using pastel, colored pencils or paint

based media such as watercolor. In this presentation we will discuss the use of colored cotton and polyester fibers derived from machine made threads to reintegrate losses in design. The technique was developed to treat a large scale watercolor, *Tintagel on the Cornish Coast* by William Trost Richards, that had sustained gouges and abrasions to the primary support.

The textile fibers, obtained from commercially available sources, were processed in various ways to prepare them for placement on the watercolor. To obtain finely divided fibers, the threads were immersed in liquid nitrogen and then cut while frozen. Admixtures of fibers can be made to approximate color tones, or successive overlapping of fibers can be done to build up color intensity. Methyl cellulose was used as the binder for both its' adhesive properties and surfactant action. Finely divided fibers tend to remain separated in methyl cellulose, a factor that helps in application. The stability of the fibers used was investigated. The removability of the fibers was assessed. Preliminary work indicates that this method has great potential for use with a variety of media where losses are small or linear. It has less potential for success over large areas, although the technique is evolving.

Cellulose powder has long been part of the inpainter's tool box and is indispensable for certain operations, such as in the concealment of foxing. The technique presented shows how cellulose powder can be made into a slurry with methyl cellulose and sprayed with an external mix airbrush to create consistent films of certain thickness and opacity. The dried films can then be shaped to the stained areas of the paper, then activated in situ with low moisture. The cellulose powder can be toned before or after application to refine the integration. A drawing by Nicholas-Touissant Charlet treated with this method will be discussed.

Testing the Waters: Applying New Techniques to the Cleaning of Acrylic Paint Films

Daria Keynan, Conservator, Daria K. Conservation, LLC; Amy Hughes, Graduate student, The Conservation Center of the Institute of Fine Arts, NYU, Dedalus Foundation Fellow in the Conservation of Modern and Contemporary Art

Techniques for cleaning acrylic emulsion paint surfaces are still emerging in the contemporary landscape of conservation. Our discipline is in a process of identifying problematic first generation practices, while pursuing improved and alternative treatments, and framing a dialogue to guide future innovations. This paper will address itself to three case studies, relating to the implementation of new aqueous cleaning systems for acrylic paint films on paper supports.

The foundational issues of this practice derive from acrylic works' sensitivity to aqueous cleaning methods. Paint film swelling and surfactant/pigment disruption are two of the primary risks facing conservators when cleaning acrylic works of art on paper. Utilizing a technique learned at the 2011 Cleaning of Acrylic Painted Surfaces (CAPS) Workshop organized by

the Getty Conservation Institute and held at the Museum of Modern Art, we applied the use of pH and conductivity meters to test acrylic paint surfaces before creating “custom-fit” aqueous cleaning solutions. The cleaning solution may be adjusted to the approximate pH and conductivity of the painted surface, thereby minimizing changes to its physical and mechanical properties.

This presentation will describe the treatments of three works on paper by three different contemporary artists working with acrylic emulsion media. First, the treatment of *In the Garden* (1986) by Paula Rego, an acrylic painting on paper with embedded dirt and dust, will demonstrate the aqueous cleaning technique adapted to numerous pigments and their mixtures as well as varying thicknesses of paint film. Secondly, *Maquette for Smoking Cigarette Relief* (1983) by Tom Wesselmann will demonstrate the technique as applied to the removal of active mold growth and associated staining. And finally, a *Classico* by Robert Ryman (1968) in which this cleaning technique proved ineffective and other options were explored. The possibility of using this method for cleaning paper supports will be discussed briefly as well.

Going Beyond Appearance: Use of Imaging Technology for the Examination of Hidden Paint Layers in a Gulistan of Sa'di from the Freer Collection

Elisabetta Polidori, Morse Paper Conservation Fellow, Boston Museum of Fine Arts; Blythe McCarthy, Andrew W. Mellon Senior Conservation Scientist, Freer Gallery of Art and Arthur M. Sackler Gallery, Smithsonian Institution; Emily Jacobson, Paper Conservator, Freer Gallery of Art and Arthur M. Sackler Gallery, Smithsonian Institution

Multi-spectral imaging technology is gaining increasing importance for the investigation of artworks on paper. It is non-invasive and relatively easy to implement, and provides valuable information about materials and working methods of the artists. Its exploitation for curatorial and technical research in the field of Islamic art on paper is not as widely adopted, but it is believed to be particularly promising.

Islamic miniature paintings are complex objects with no set structure, which are often extensively modified throughout their history in response to changes in style and ownership. The *Gulistan* of Sa'di from the collection of the Freer Gallery of Art, Washington DC, is an especially notable and illustrative example of these practices. The manuscript was copied in 1468–69 in Herat, capital of the Timurid Empire. It then travelled to Tabriz, where lavishly illuminated borders were added around the mid of the 1540s at the royal workshop of the Safavid ruler Shah Tahmasb. Under the reign of the Mughal emperor Shah Jahan (1628–57), the original illustrations were completely repainted by some of the most respected artists of the court, but tantalizing traces of the earlier paintings can be seen on the opposite sides of the folios as discolored areas produced by copper-based pigments.

A thorough imaging campaign aimed at revealing as much as

possible of these pre-existing paintings was performed as part of a fellowship funded by the Smithsonian Institution and hosted by the Freer Gallery of Art and Arthur M. Sackler Gallery, Washington, D.C. The main tool used for this purpose was the VSC 6000, a high resolution multi-spectral imaging system manufactured by Foster and Freeman, and designed for forensic investigation of questioned documents. Examinations using reflected and transmitted visible light, UV light and reflected and transmitted IR light were performed with this instrument. Additional pivotal information was acquired with X-ray computed radiography and a targeted use of XRF undertaken in the Department of Conservation and Scientific Research at the Freer Gallery of Art.

From an art historical perspective, the investigation successfully exposed sections of the underlying paintings, allowing comparisons between Persian and Indian depictions of the same subject. From a technical standpoint, it drew attention to the potential and limitations offered by the implemented equipment, and to the specific challenges involved in the investigation of Islamic miniature paintings. This research also offered an opportunity to devise a method that coherently brings together the complementary information obtained in the different spectral regions.

Conservation and Encasement: 1297 Magna Carta

Terry Boone, Senior Conservator for Exhibits, National Archives; Morgan Zinsmeister, Senior Conservator, National Archives

Interest in sealed anoxic encasements for long-term preservation has grown in the past few decades, particularly in the United States where a number of encasements house some of the nation's most historically significant parchment and paper documents. The National Archives and Records Administration (NARA) recently completed an eighteen month project to encase a 1297 Magna Carta. The parchment document with attached pendant seal had been placed in an encasement designed by Nathan Stolow in 1980s, shortly after it was purchased and brought to the United States. Soon thereafter, Magna Carta was placed on long-term loan for display at the National Archives building in Washington, D.C. where it was on almost continuous display. A team of NARA conservation and exhibitions staff partnered with staff of the National Institute of Standards and Technology (NIST) to develop a state-of-the-art anoxic encasement, for the one of two copies of Magna Carta held outside of the United Kingdom and the only copy in the Americas.

The collaborative effort provided an opportunity to revisit the exacting standards developed by the two federal agencies during the late 1990s and early 2000s for the encasement of the United States Declaration of Independence, Constitution, and Bill of Rights, and adapt them to the unique needs of Magna Carta. The resulting encasement ensures long-term stability of the document and meets additional requirements for security and exhibition.

This paper will discuss various aspects of this project including a brief overview of the history of this particular copy of Magna Carta including its 1980s encasement. However, the authors' primary focus will be on the 2011 and 2012 conservation treatment, as well as the design, fabrication, and assembly of the new encasement.

Update on Digital Print Preservation Research: What We Have Learned So Far About the Permanence and Preservation of Digitally Printed Books

Daniel Burge, Senior Research Scientist, Image Permanence Institute

Many contemporary books and periodicals are now being created with digital printing equipment. These devices use colorants, and often papers, which are different from those used traditional offset lithography. This raises the question for collection caretakers, "Will these materials need a new preservation approach?" For the last five years the Image Permanence Institute (IPI) has been studying the preservation of digital hardcopy materials and developing strategies to maximize their useable lives in cultural heritage collections. Potential deterioration factors for the materials include heat, humidity extremes, air pollutants, light, enclosure materials, handling, and exposure to water (as during floods). In the last two years IPI has added bound volumes to their studies in addition to individual prints. Bound pages have been found to behave similarly to individual prints in some ways, but in other ways their constructions and use positively or adversely impacts their long-term stability. This is a review of the work to date.

Watermark Capture and Processing with Contemporary Desktop Applications

Fenella G. France, Chief, Preservation Research and Testing Division, Library of Congress; Margaret Castle, Preservation Research and Testing Division, Library of Congress; Daniel de Simone, Rosenwald Curator, Rare Book and Special Collections Division, Library of Congress; Meghan Hill, Preservation Research and Testing Division, Library of Congress; Christopher Bolser, Student, University of West Virginia; Sylvia Albro, Senior Paper Conservator, Library of Congress; John Bertonaschi, Senior Rare Book Conservator, Library of Congress

The *Calendarium*, written by Johannes Regiomontanus ca. 1474 and printed in Nuremberg the same year, is part of the Rosenwald

Collection in the Rare Book and Special Collections Division at the Library of Congress. This book is a superb example of block book printing, essentially a picture book, where the text and image were carved in relief into a block of wood, inked, and then pressed against paper leaving an impression of words and pictures. It emerged in the fifteenth century as a form of duplication for the purpose of educating a semi-literate population, in much the same way that stained glass windows rendered the lives of the saints to a religious congregation. In this case, Regiomontanus's scientific observations were intended for an audience of astronomers and astrologers. Block books were originally thought to be the precursor of printing with movable type, but modern research has indicated that these scarce books were created during the same period that Gutenberg introduced printing to Western Europe.

This block book edition of the *Calendarium* is printed on 31 leaves of paper, some of which contain watermarks identifying the paper mill that produced the paper. These watermarks are of interest to researchers interested in establishing the dates that various sections of the calendar were printed. Watermarks present on the pages were heavily obscured with diagrams and text, so various techniques were employed to utilize desktop applications and enhance the watermarks for ease of viewing and identification.

Initial spectral imaging (reflected and transmitted) captured information in 14 wavebands; the registered images were then stacked and run through a simple Principle Component Analysis (PCA) algorithm to enhance variation between text, diagrams, and paper. Selected PCA bands were then imported into Photoshop layers and hue, saturation and brightness changes were experimented with to generate the best composite image. The overlaying text was changed to match the background tone and coloration. Hue changes included changing reds to yellow, blue text to gray to decrease the saturation, and darkening of greens. The Photoshop draw tool was then used to connect the segments and reveal the watermark. If watermark sections were on different sheets these were brought together and stitched together to form a rendering of the complete watermark, and similar watermarks could also be overlaid in Photoshop to check for changes in the mold.

Four distinct watermarks and variations were captured. In addition, the processing revealed a section of hidden printed text in the gutter of the folio, with the same text being present on a number of folio sheets. This technique allows conservators, curators and researchers to capture and easily manipulate and process watermarks using contemporary software tools, for provenance of historic paper book and paper materials.

***The Legible City*—One Artwork, Multiple Embodiments**

Arnaud Obermann, Conservation Coordinator, INTERREG Project, ZKM | Center for Art and Media Karlsruhe

The Legible City (1989–1991) is one of the major works of the Australian media artist Jeffrey Shaw and a milestone of 1990s interactive, computer-based new media art. In this installation, the spectator rides a stationary bicycle in a dark room, experiencing a virtual journey through projected views of the cities of Manhattan, Amsterdam, and Karlsruhe. The real physical exertion on the bicycle is converted into the virtual distance covered.

Since the beginning of his career, one of Jeffrey Shaw's main preoccupations has been the overcoming of the traditional, institutionally laid-down distance between the artwork and the viewer. From the mid-1970s on, Shaw moved from sculptural to computer-based work, seeing the computer as a particularly efficient medium for his work since programmed software configurations could function as modules, which could be adapted to create new artworks.

Jeffrey Shaw's *The Legible City* illuminates numerous problems specific to the emerging field of digital art preservation. On the one hand, the interactive installation is based on proprietary, i.e. work-specific and licensed software. On the other hand, it uses obsolete hardware and custom-made components. Both factors contribute to the high cost of maintaining this work. By tracing the complex evolution of this artwork since its first presentation in 1989, this paper aims to illuminate the various strategies employed by the ZKM | Center for Art and Media Karlsruhe for the maintenance and preservation of this installation over the course of the past twenty years.

In his double capacity as artist and director of the ZKM | Institute for Visual Media from 1991 till 2003, Jeffrey Shaw carried out several changes to *The Legible City*. Since the creation of a prototype (1988) of the artwork—which could interactively be operated by a joystick—the interactive installation has undergone several technological modifications, partly owed to the artist's desire to take advantage of enhanced software possibilities, and partly caused by the obsolescence of components. Since the artwork was acquired by the ZKM | Center for Art and Media Karlsruhe, the institution has adopted the strategy of “hardware preservation” for the conservation of the artwork.

The Legible City is one of the ten case studies of the EU-funded research project “digital art conservation” (January 2010–December 2012; digitalartconservation.org) and part of the traveling exhibition “Digital Art Works. The Challenges of Conservation” (held at the ZKM | Center for Art and Media from 29 October 2011–12 February 2012). As part of the case study, an in-depth retrospective documentation of the different stages of alteration of the work was carried out for the first time, with the aim to formulate recommendations for the long-term preservation of this artwork with regard to its authenticity and integrity. In addition, in dialogue with the artist, a porting of the

software was carried out. This paper will reflect the measures undertaken over the course of the installation's 20-year history as well as this most recent undertaking.

Preservation and Restoration of Photographic and Audiovisual Materials after Large-Scale Disasters

FennaYola Tykwer, Time-based Media Conservator and PhD Candidate, Stuttgart State Academy of Art and Design

The presentation will introduce into the problems after the collapse of the Historical Archive building in Cologne in 2009, where about 90% of the holdings were either lying beneath the mountain of rubble or among the debris in the underground railway shaft outside the building. With more than 500,000 photographic and 5,000 audiovisual objects among the salvaged holdings. And each item needs a thorough cleaning and adequate repackaging and at least in many cases, further restorative measures will need to be taken. It is estimated that all in all, more than 6,000 man years will have to be put in for conservation alone. So processes for mass treatment in the restoration of these materials and an exchange of experiences in the realization will be needed and set up in the speech. The general workflow distinguishes between a first phase of basic conservation and restoration measures which can be taken with all items, regardless of their state of identification. Later on, more sophisticated (and costly) restoration processes will be prioritized with respect to collections, individual value of the object in question and availability of sponsorship.

The presentation will take a look at the perspectives for the work in a new organized studio for conservation and restoration of photographic and audiovisual materials at the branch Office in Wermsdorf (Germany).

Apart from normal processes of conservation and restoration, the possibilities of the reconciliation of negatives and damaged photographs will be presented and different ways of re-using these negatives will be shown. The presentation will point out the possibilities and problems of cooperations with other institutions to make use of available records—in case of live recordings—from other archives, too.

Technical Documentation of Source Code at the Museum of Modern Art

Deena Engel, Department of Computer Science at the Courant Institute of Mathematical Sciences, New York University; and Glenn Wharton, Time-based Media Conservator, Museum of Modern Art & Museum Studies, New York University

As part of its program to conserve software-based artworks, the Museum of Modern Art undertook a risk analysis of thirteen works that use a variety of software programs, programming

languages, and libraries. Eleven artists and two programmers were interviewed as part of this project. They were asked about the software, the hardware dependencies, and their concerns for future presentation of the artworks.

Risks assessed in this study include the potential impact from changes and upgrades to hardware, operating systems, programming languages and/or software applications used to create the artwork that would render the software or any associated multimedia files obsolete, thus jeopardizing future exhibition.

It became evident from this analysis that acquisition and technical documentation of source code is key to preserving these works. MoMA partnered with the Computer Science Department at New York University's Courant Institute of Mathematics to perform a pilot study to document the source code of four artworks. The project used standard software engineering methods to analyze the code and create textual documentation for future programmers who may need to recompile or re-write it for new operating environments. The documentation will also aid future researchers in better understanding the principles behind the work. Technical documentation of code is standard in the software and business industries, but it is new for museums. Due to artist concerns for public experience of their work, standard methods in the software industry must be adapted for museum collections.

In this presentation, the authors describe their collaboration to document the source code of these artworks. The focus is on documenting how aesthetic properties such as color, movement, and sound are determined in the source code.

Pericles and Presto4U—Two European Funded Projects Progressing Research in the Conservation of Digital Art

Dr. Pip Laursen, Head of Collection Care Research, Tate

This paper aims to provide an overview of two European funded projects which will begin in early 2013 and which include the conservation of digital arts within their purview. The four year project, Pericles, considers the preservation life cycle for digital arts and Presto4U, focuses on video preservation and includes art museums and collections as one of its communities of practice. Both of these projects ask why previous research has had such small take up within the museum sector, specifically among those dealing with the conservation of digital arts. These also aim to develop tools and methods which will help to support the conservation of these works of art in our care.

The author will describe the aims of these research projects, the importance of building partnerships and developing a common understanding and vocabulary with those working within digital humanities and the archive community and how participation in this research is impacting approaches to the conservation of digital arts. The paper aims to develop alliances and dialogue between these research projects and those working in this area within the U.S.

Digital Video Preservation in Museums and Small Collections

Patricia Falcao, Time-Based Media Conservator, Tate

In the past 5 years contemporary art museums, and other institutions actively collecting artists' video, have witnessed a significant technological shift from video tape to digital file as the primary form of video material coming into our care. This shift has been caused by artists producing new work as digital files and also by a change in institutional migration programs as we move from tape to file in response to the ongoing needs of preservation and display.

As a consequence of this shift, institutions rapidly need to become familiar with a new set of technologies for the preservation, storage, and display of video. To effectively respond to these changes, new alliances are needed with the broadcast industry and the archive sector and also, crucially, with the IT domain.

In 2012 project members for Matters in Media Art decided to conduct a small survey in order to create a snap shot of this area of emerging practice. Staff from 12 institutions in the U.S. and Europe who are recognized as amongst the leaders within our sector in addressing the challenges associated with caring and managing video as digital files were interviewed. In addition to gathering information about practice with regard to both artist supplied digital files and files created during the migration from tape formats, the survey also captured information about the type and size of the video collections and the resources available. The survey has resulted in a greater understanding of the strategies, solutions and challenges these institutions are currently facing.

This paper will discuss the results of the survey and identify common practices that may be generalized for other institutions, as well as identify needs for training and tools.

Wrangling Electricity: Lessons Learned from the Mass Migration of Analog and Digital Media for Preservation and Exhibition

Peter Oleksik, Assistant Media Conservator, Museum of Modern Art

In 2011, the Museum of Modern Art began a process of making its extensive video art collection of over 1500 works available to the public through an installation of interactive monitors in the galleries. With a collection that spans the history of independent video production, the project was especially urgent because of video degradation in some of the early works, technology obsolescence, and the availability of some of the original artists. To facilitate the project, an in-house transfer and monitoring station was established at the museum. Numerous systems were developed for transport, in-house migration, metadata capture, working with artists, and outsourcing some of the migration. Now with over half the material migrated and the launch of MoMA's media lounge in February 2012, a large body of information has been collected that helps inform best practices in

migrating and managing video art. This presentation will detail the project workflow that was formulated in collaboration with MoMA's media conservators, curators, registrars, audiovisual staff, and IT department. Special attention will be paid to the question of in-house migration vs. vending out to specialized transfer houses. Examples will be drawn from the project to illustrate challenges in migrating analog and digital material and the impact of performing migration and other media conservation work within the museum. Whether you are dealing with 1 analog source or 100,000, this presentation will hopefully further the discussion on the conservation of analog and digital moving image material.

FUTURE, or How to Live Forever

Annet Dekker, Curator and Researcher, Centre for Cultural Studies, Goldsmiths University

Net artist Igor Stromaier started to delete all of his net artworks in 2010. Over a period of 37 days he deleted one of his artworks each day, from the conviction that "if one can create art, one can also delete it. Memory is there to deceive." Other artists like Constant Dullaart and Robert Sakrowski are giving people guidelines on how best to document their, or other people's, net artworks. Their approach of subjective documenting, and straightforward collecting of metadata is aimed at the participation and exchange of the collected documentation by all parties interested in preservation of Internet based artworks. At the same time more and more net artists are translating their online artwork into objects, sculptures and installations, experimenting with ways to present and document their work for future generations.

In the last decade a discussion on how to preserve net art for the future is also starting to emerge in museums for contemporary art. This growing attention is wonderful and more than justified, but most methods still depart from the "final" project, albeit static, variable or networked. What has been given little attention is the ways these works are made (produced) or documented by artists. In this paper I will argue that the way artists make, use and present their documentation, from the work in progress to the final presentation, can give a lot of information about the work, which is of vital importance for the preservation or recreation of a work. By analyzing artists' documentation methods and comparing these to the information that is asked for in traditional museum documentation models showed that specific and inherent qualities of the artworks are not taken into account in the models up till now. For example, closer analysis of Blast Theory's creative processes indicated that integral information might get lost when using standard questionnaires or applying emulation methods that transfer the game-play to new platforms.

In this paper I will trace and map out the consequences for conservation by analyzing the multiplayer game *Naked on Pluto*, a work that is based on process and relies on a commercial and

restricted online platform—Facebook. Although this is a rather extreme case study, because there is still little analytical reflection on artworks that proliferate on commercial social media platforms let alone interest of museums for presentation or acquisition of these works, I will show that this practice is gaining attention with artists and thus can be regarded as paradigmatic for contemporary artworks. When it comes to born-digital artworks, conservation has missed the ability to understand the specific and large-scale changes that computational culture has brought about. Most practices still depart from the traditional object oriented way of dealing with the artwork and fail to understand computing as inherently cultural, social, networked, and process based. I argue for a conservation practice that departs from the digitally native and adopts similar strategies. Instead of working towards an object-oriented approach of fixation I propose to focus on documenting the process and experience of a work, i.e. keeping knowledge and memory alive but accepting a loss in history.

A Hands-Off Approach to Controlling Media-Based Artworks

Brad Dilger, Multimedia Specialist, Indianapolis Museum of Art, and Richard McCoy, Conservator of Objects and Variable Art, Indianapolis Museum of Art

With the continued and increasing use of electronic media components in contemporary art projects, a need has arisen to efficiently and accurately control the active cycle of these components while on display. The Indianapolis Museum of Art (IMA) has created a novel approach to effectively manage its contemporary art projects that have electronic media components using a "hands-off" approach.

There are several methods controlling electronic media components in galleries, such as simple timers, manufacturer-based, internal controls, the occasionally unreliable human controller, and computerized control systems. For the past 7 years the IMA has tested, installed, and maintained an innovative and effective approach to controlling its electronic media components in the gallery with a completely computerized control system. The IMA's solution, which was created through an inter-departmental working group from the Installation Department, Conservation Department, and Information Technology (IT) Department, does not require daily human interaction to maintain a gallery schedule. This relatively low-cost solution allows electronic media components to be controlled both autonomously and via web-based graphical user interface (GUI). This GUI can easily function from smart phones.

Autonomous control of electronic art is based on a system of linking together different software and hardware components from various manufacturers. This technology has had widespread use in commercial, educational, and residential applications to control all aspects of a building functions: Lighting, HVAC, security, entertainment, irrigation, are just a few systems that can

be covered by computerized control systems. It is believed that the IMA is the first museum to apply this system to electronic media components in contemporary art projects and has been using the solution for nearly a decade with great success.

This approach achieves an important goal of relieving staff from having to physically manipulate electronic media components in the gallery on a day-to-day basis, and has dramatically increased the efficiency and proper functionality of contemporary art projects by reducing their gallery “downtime” caused by errors.

This paper will discuss three case studies based on IMA art installations. These case studies will demonstrate the success and limitations of the system, and provide clear guidance for other institutions for installing this system.

Expanding into Shared Spaces—SFMOMA’s Black Box Studio

Martina Haidvogel, Advanced Fellow in the Conservation of Contemporary Art, San Francisco Museum of Modern Art

Teamwork and communication between curators, technicians, registrars, and conservators prove to be invaluable in the preservation of media art installations. The San Francisco Museum of Modern Art (SFMOMA) has a long history of fruitful, interdepartmental collaborations and with the upcoming expansion of the museum, scheduled to open in 2016, working spaces have been conceived and designed to reflect and advance this tradition. This talk explains this series of adjacent and shared spaces — a black box workshop, a time-based media conservation studio and an exhibitions technical workroom — where time-based media conservators and the exhibitions technical team will prepare, stage, document, repair and thus preserve the museum’s rapidly growing media arts collection.

The Role of the Technical Narrative for Preserving New Media Art

Mark Hellar, Principal, Hellar Studios LLC

In 2009 the San Francisco Museum of Modern Art initiated a project to develop a sustainable, long-term preservation strategy for software-based artworks. For this research two artworks in its collection were examined.

The first work, Julia Scher’s *Predictive Engineering 2* (1998), a web-based artwork that accompanies a large media installation and mirrors the formative years of HTML programming in the 1990s. The second work, *Agent Ruby*, was created by San Francisco-based artist Lynn Hershman Leeson, a pioneer of media-based and conceptual art. Hershman’s work features a custom code for artificial intelligence that is embodied by an avatar that can talk back to viewers.

The technical complexity and different media components

of these works created a need for new forms of documentation and the concept of a technical narrative was developed. It is a standardized system for documenting digital artworks. The purpose of the technical narrative is to describe:

- A high level functional description of the work. This is a general description of how the work functions and operates as a whole. This part of the narrative is a platform-neutral description of the work in a general and functional way.
- A modular examination of the individual components of the work and their specific functions. The intent of this section is to look at every individual component of the work in detail. Additionally a high level examination is given to how all of the parts work as a complete system. This section attempts to map out a general technical schematic of the work.
- A detailed description of the artwork as it exists upon acquisition. This section is specific about the hardware, software, operating systems, languages, algorithms, video codecs, etc. These platforms, components and technologies are examined closely to inform an understanding of how they serve operational requirements of the work. This section is closely tied to the technical documentation provided by the artist and their engineers, describing the pragmatic requirements for operation and display.
- An analysis of the current technology platform and an evaluation of its longevity against the current state of technology. Here we consider the long-term stability of the piece upon acquisition. It calls out strategies and concerns in preserving the work over the long term and informs ongoing conservation and maintenance protocols including possible strategies for migration or emulation.

The technical narrative is now a standard piece of documentation for all digital based artworks that are acquired by SFMOMA including video, audio and software-based art. This presentation and paper will describe the technical narrative in detail and the processes involved in its creation. Some real world examples from the documentation of software-based artworks and multi-channel video installations will be covered.

Let’s Talk Digital: An Approach to Managing, Storing, and Preserving Time Based Media Art Works

Alex Cooper, Lighting Designer, National Portrait Gallery, Smithsonian Institution; Isabel Meyer, DAMS Branch Manager, Office of the Chief Information Officer, Smithsonian Institution

Born digital Time Based Media Art (TBMA) works are an emerging and rapidly growing art form which pose significant technology challenges to art museums and other collecting institutions across the globe. Within the Smithsonian Institution (SI),

the Office of the Chief Information Officer (OCIO) and the National Portrait Gallery (NPG) are working together to address the unique challenges inherent in preserving works of this kind. Born-digital works are generated in real time using digital information stored in the form of binary data. As such, they are vulnerable to the same integrity (data corruption) and obsolescence concerns of any digital file format or software. The preservation of born-digital works requires both IT-based infrastructure to safely store and organize this data, as well as an organizational method to document, describe, and categorize information related to the artist's intent and the work's provenance.

To meet these needs OCIO has developed the Digital Asset Management System (DAMS), and the NPG has created the TBMA Archival Package. The DAMS is an enterprise-level Digital Asset Management System used to store, manage, preserve, and share the Smithsonian's rapidly growing collection of digital assets and related information.

An enterprise digital asset management system is essential to meeting SI's objectives for:

- Preservation and stewardship of objects and specimens.
- Organizing, classifying, and locating digital assets.
- Delivery of digital assets in multiple formats.
- Public outreach and education and electronic commerce.
- Participation in external cultural heritage, library, and science initiatives.

The Time Based Media Archival Package is a method used to organize TBMA assets including the digital essence of the work, as well as related curatorial, exhibition, and collections management related documents. This presentation will include discussions of the DAMS system architecture (hardware, database, application software, storage, staffing resources, and operational procedures) as well as functional aspects of the DAMS (user roles, asset security policies, ingest methods, metadata models, and transcoding) as well as the structure of the TBMA Archival Package, and its various components.

I Know a Guy: Collecting Technical Documentation, Locally

Steven Villereal, Audiovisual Conservator, Preservation Sciences Department, University of Virginia Library

As cultural heritage institutions have recognized the urgency of migrating rare and unique analog video content off of

unstable carriers, many have begun to establish facilities for in-house reformatting. In determining which materials could be responsibly digitized in-house, open reel video formats are frequently written off as too problematic to tackle and remain in the purview of specialized vendors. In many cases this assumption is absolutely correct—scarcity of functioning playback equipment and the technical skills to operate it are logical deterrents.

This brief presentation will address an alternate tack, focused on collecting local technical expertise (as well as equipment) and documenting period production practices, with an eye towards in-house reformatting. The proposed case study is a collection of 1" IVC video, salvaged by a former employee of Charlottesville's early local origination cable station. Through contact with former station staff, we have sought to document the technical and production expertise needed to understand how equipment was operated and how tapes were produced. This outreach work has helped us to acquire rare playback equipment, as well as putting us in contact with a local video engineer conversant with this obsolete 1" format.

This talk will provide an overview of this project, with wider recommendations for how documentation can be collected with the explicit goal of overcoming format-specific technical hurdles.

Conserving Custom Electronic Video Instruments

Mona Jimenez, Associate Director, Moving Image Archiving and Preservation Program, NYU

Electronic video instruments are custom devices developed during the 1970s and 1980s that were used to make video art and other time-based media works. The devices include synthesizers, colorizers, keyers, sequencers, video capture devices, computer interfaces, and oscillators, to name a few. They may be modified commercial devices or machines built from scratch. The presentation will consider theories, guidelines, and practices within instrument conservation, industrial conservation, and time-based media conservation that are relevant to the conservation of machines. A central question is whether the machines can and should continue to be "worked" after they are collected. Also, the presentation will look at user and institutional efforts to save the video instruments and at new instruments being developed for artists' use.

***Bon Appétit?* Plastics in Julia Child's Kitchen**

Mary Coughlin, Assistant Professor, Museum Studies Program, The George Washington University

In 2001, Julia Child donated the kitchen from her Cambridge, Massachusetts home that was the set for her cooking shows in the 1990s to the Smithsonian's National Museum of American History (NMAH). As a kitchen that was in use from 1961–2001, plenty of plastics ranging from silicone spatulas to a Rubik's Cube came into the collection along with more traditional kitchen items.

Soon after the acquisition, NMAH opened the exhibition *Bon Appétit! Julia Child's Kitchen* at the Smithsonian. What was meant to be a temporary exhibit proved so popular that it remained up for a decade. In 2010, NMAH staff began planning for a new exhibition space that will include the kitchen. The new exhibit, *FOOD: Transforming the American Table, 1950-2000* opened in November 2012. In preparation for the exhibit, in 2011 students from the Museum Studies Program at The George Washington University worked under the supervision of a professor and objects conservator, Mary Coughlin, and NMAH curators to assess the current condition of the objects and make recommendations to better incorporate preventive conservation into the new exhibit.

During the class, it was discovered that several of the plastics are not aging well. These included dishwashing gloves that were originally blue but turned black on exposed surfaces, a plastic dish rack that is weeping, Julia's personal phonebook encased in a degrading PVC binder, a bulb baster that is now completely rigid, and silicone spatulas, some of which have discolored while others are weeping. As some plastics age they can emit acidic vapor, so A-D (acid-detecting) Strips were used to monitor the plastics in the kitchen. Results from using the A-D Strips showed that several of the plastics are actively off-gassing acids.

The plastics in the kitchen proved to be a prime example of the issues that will be faced more and more as contemporary objects made of plastics enter museums. One hope is that the new exhibition's improved lighting and environmental controls will at least not accelerate the rate of some of the degradation. A comparison between conditions in the old and new exhibitions will be presented.

The discussions between the curators, conservator, and students, who are studying to become collections managers, regarding whether or not to continue to display the degrading plastics were interesting. Conservators and collections managers generally do not want to leave an object on display when it is known to be degrading and has the potential to negatively impact nearby materials. But when considering the curatorial perspective, how much of an impact will be made by removing original artifacts? Do you replace them with reproductions? At what point is the kitchen no longer in its original state as used by Julia Child? The intersection of the wish to be as authentic as possible even if it means displaying deteriorating plastics and the desire to preserve these objects proved to be an intriguing aspect of this project.

Establishing Conservation in an Unconventional Venue in Okinawa

Anya McDavis-Conway, Research Scientist and Objects Conservator, Okinawa Institute of Science and Technology (OIST)

A new conservation initiative was recently established at the Okinawa Institute of Science and Technology (OIST). The OIST Conservation Project was envisioned as a way to use the cutting-edge scientific resources available at the Institute to help in the preservation and study of Okinawan cultural property. Reversing the usual order, the project was founded without already having an art collection or museum partner. This presentation will discuss the creation of the OIST Conservation Project, including setting up a conservation lab at a science university and securing museum partners, followed by a description of recent accomplishments in the investigation of Okinawan cultural materials.

As a new international and interdisciplinary science university located in Okinawa, OIST epitomizes a contemporary situation. The Institute strives to reinvent how Japanese higher education approaches science while also giving back to the Okinawan community. Located on a small island south of the Japanese mainland, modern technology keeps OIST connected with the rest of the world and facilitates OIST's researchers in their ability to make advancements in their fields. In turn, the Okinawan islands (formerly the Ryukyu kingdom) have an interesting international history of their own, which has greatly influenced Okinawa's art and culture. Additionally, the unforgiving climate combined with destruction associated with World War II makes the preservation of Okinawa's cultural property a critical issue. OIST's access to an abundance of innovative scientific tools has sparked creative thinking in the study of Okinawan artifacts.

With the lofty goals of contributing to the preservation of Okinawan culture and embarking on exciting art and science collaborations that would captivate the public, OIST was put in the position of "selling" its proposed conservation initiative to local museums, as their involvement is critical to the success of the program. In time, the cooperation of two institutions, the Yomitan Village History Folklore Museum and the Tsuboya Pottery Museum, was secured. These art and science collaborations involve conservation treatment as well as research into the museums' collections. For example, the unique environment at OIST has allowed the before-treatment examination of two *sanshins* (Okinawan string instruments) to lead to investigations into the origin of their leather coverings using mass spectroscopy to identify their proteins as well as experiments with DNA sequencing. OIST researchers are working to overcome the challenges of degradation and contamination in the analysis of these *sanshins'* unique leather coverings.

Ceramics have also played an important role in Okinawa. Therefore, the Conservation Project is working to characterize and provide a deeper understanding of Okinawan ceramics. The latest generation of X-Ray Fluorescence Spectrometers and X-Ray Diffractometers are being used in the investigation of these ceramics to identify materials, understand past

manufacturing techniques, and determine firing temperatures. Most notably, this information will be used to differentiate between ceramics made on the Okinawan mainland and nearby Ishigaki Island. Other techniques under consideration for this project include X-Ray Photoelectron Spectroscopy and X-Ray Absorption Near Edge Structure (XANES) Spectroscopy.

The OIST Conservation Project has established a new model for how a conservation project can function. This international yet remote setting allows for a contemporary take on a conservation lab venue.

Three Decades Later: A Status Report on the Silver Lacquering Program at Winterthur

Bruno Pouliot, Objects Conservator and Assistant Professor, Winterthur Museum, Garden and Library; Jennifer Mass, Senior Scientist and Adjunct Assistant Professor, Winterthur Museum, Garden, and Library; Catherine Matsen, Associate Scientist, Winterthur Museum, Garden and Library; William Donnelly, Conservation Assistant, Winterthur Museum, Garden and Library; Kaitlin Andrews, Conservation Assistant, Winterthur Museum, Garden and Library; and Margaret Bearden, Conservation Assistant, Winterthur Museum, Garden and Library

Just over 30 years ago, Winterthur began its first museum-wide campaign of cellulose nitrate lacquer application to its collection of historical silver objects displayed predominately in open Period Room settings, i.e. not in display cases. This coating was chosen after testing demonstrated that it could protect the silver from tarnishing for a period of approximately 28 years under regular museum conditions. The lacquering program continues at Winterthur today for about 3,000 silver objects on permanent display in Period Rooms and in the Study Collection.

The authors will discuss a project currently underway, which began with a survey of 1,500 lacquered pieces performed to determine the effectiveness of the coating over the years. The results of this survey indicated that the coating had begun to fail on about 42% of the silver pieces. The results were also instrumental in the development of an intensive second campaign of cellulose nitrate lacquering begun in August 2011. As part of this initiative, funded in part by an IMLS grant, 750 silver objects will be re-lacquered, focusing on pieces where the lacquer is oldest or has failed for different reasons.

This paper will present the results of many observations made during the project to better understand the behavior of cellulose nitrate coatings on silver objects, its progressive change over time, the instances why it may or may not fail, and the methods used for the removal of old coatings and re-application of new ones. This will include the preliminary results of a study of failed/discolored coatings via FTIR, tarnish/corrosion products via Raman, FTIR, XRD, and XPS, and how the presence of lacquer may affect XRF analysis of silver as compared to incipient tarnish.

Coating with cellulose nitrate, a material with inherent chemical instability, may at first seem counterintuitive in

conservation; to that effect, other preventive methods exist and are successfully in use at Winterthur to retard silver tarnishing. Yet the results of this study demonstrate how effective cellulose nitrate coatings have been within the open environment of Winterthur's Period Rooms so long as the coating is properly applied, the objects appropriately handled, and with plans and resources in place for the coating's eventual and "unavoidable" reapplication.

Rethinking the Monumental: A Creative Approach to the Preservation of a Landmark Tony Smith Outdoor Sculpture

John Steele, Conservator of Sculpture and Decorative Arts, Detroit Institute of Arts; and Abigail Mack, Object Conservator and Principle, Abigail Mack Art Conservation LLC

This presentation describes the collaborative planning process for treatment of Tony Smith's *Gracehopper*, a monumental painted-steel outdoor sculpture at the Detroit Institute of Arts. *Gracehopper* created a particular challenge for conservators because of its large size, the strict aesthetic parameters for its surface appearance, and ongoing changes in the coatings industry. The physical and aesthetic criteria that shaped the treatment plan for this remarkably complicated object will be examined, as well as the shared decision-making process that involved a host of stakeholders, including conservators, a curator, the artist's estate, a paint specialist, private funders, and the public.

Although initial efforts focused on a quest for the perfect paint, it was only when all the components of the project—including size, accessibility, paint technology, surface aesthetics, and cost—were weighed that a clear path for treatment revealed itself and an effective plan developed. Project delays allowed the conservators time to reexamine an initial proposal to repaint the sculpture by spray application, on site, with the necessary containment structure. Since the enormous tent needed for containment proved to be prohibitively expensive and an acceptable surface by spray application of the high-performance paint would be difficult to achieve outdoors, the conservators reconsidered their plan. In the 1970s, the artist/fabricator team had installed and coated the sculpture on site with roller-applied industrial paints to the artist's satisfaction. Through consultation with the Tony Smith Estate, paint specialists, and a review of museum documentation, the conservators and curator explored replicating the artist's original application methods while using today's high-performance exterior coatings. The potential benefits were many, including easier application, easier local treatment of damaged surfaces in the future, and lower costs.

Careful and cooperative consideration of all the variables affecting the treatment led the project team to explore a variety of options. Together, they successfully developed a plan for treatment that is cost-effective, durable, and honors the artist's original aesthetic requirements.

Metal Health and Weld Being: Conservation Strategies for a Collection of Sculpture by John Chamberlain

Shelley Smith, Objects Conservator, The Menil Collection; and Catherine Williams, Objects Conservator, Silver Lining Art Conservation, LLC

Complex contemporary sculptures composed of re-used materials present numerous practical challenges for conservators in regard to description, documentation, conservation treatment, handling, and long-term condition tracking. In addition, these sculptures illuminate biases about reused materials that generate incorrect assumptions about structural stability or long-term preservation. Such sculptures also present philosophical dilemmas that are familiar in the context of conservation of contemporary art, such as unorthodox treatment methods that challenge traditional conservation ethics, but are most suitable for the stability of the sculpture and maintaining the artist's intent.

This paper addresses the practical and philosophical issues faced by conservators while developing short- and long-term preservation strategies for a collection of 12 John Chamberlain sculptures in the Menil Collection. John Chamberlain (1927–2011) created abstract sculpture out of salvaged auto parts and reused sheet metal from industrial and commercial sources. In addition to taking advantage of his raw materials' used condition, the artist worked in a collage-like manner, spontaneously spot welding or fastening pieces in place. The resulting sculptures exemplify the rough history of the raw materials and exuberance from the artist's working methods that belie the complexity and fragility of the sculptures' materials and structure.

Research into Chamberlain's fabrication techniques and the industrial manufacturing processes of the materials used in his sculpture are described in the paper, as well as research and consultation with curators and specialists, and past conservation treatments. Two interviews with the artist over the course of 13 years informed the decisions made throughout the duration of the treatment. These interviews illustrate the value of interviewing artists directly, and how their memory and perception of the work may change over time.

To solve problems of documentation and condition reporting, a new standard methodology of documentation was developed specifically for this collection of sculptures. This standard documentation, which included a descriptive report template, specific photographic procedures, and protocols for annotating photographs using an iPad, proved invaluable in identifying the conservation needs and priorities of each sculpture, while allowing us to draw comparisons between sculptures and follow changes in the artist's working methods over time. The implementation of a standard documentation methodology also facilitates tracking of condition issues in the future, and can be used as a model for documenting complex sculptures by other artists.

The paper also describes the practical aspects of conservation treatment of several Chamberlain sculptures, which involved collaboration between a team of conservators, art handlers, and

a master metal craftsman, and documentation of the treatment with time-lapse photography.

Overall, this project addressed dilemmas in the conservation of artworks where treatment methods that are most suitable for the sculpture and are also integral to maintaining the artist's intent challenge traditional conservation practices and ethics. Documenting and treating the collection as a whole provided an opportunity to develop a systematic approach to documentation and treatment to provide clear, consistent information regarding decision-making rationale.

Three-Way Plug Three Ways: Conservation Treatments of Three Editions of Claes Oldenburg's Cor-Ten Steel and Bronze Giant Three-Way Plug

Mark Erdmann, Conservator of Objects, ICA Art Conservation; Adam Jenkins, Conservator in Private Practice; Robert Marti, Co-Owner, and Marianne Russell Marti, President, Russel-Marti Conservation Services, Inc.

Claes Oldenburg created his monumental sculpture *Giant Three-Way Plug* in 1970. He viewed the piece as a coming together of the mechanical and the organic, and he anticipated the evolution of its patina as a reflection of the "events of nature" around it. However, almost immediately after installation, efforts were being made to arrest these evidences of nature and maintain a current image free from further deterioration. The artist himself recognized the tension between a philosophical ideal and the reality of gradual deterioration when he stated his preference for either pristine polished bronze or completely oxidized brown or green, but nothing in between. The in-between state of streaked and pockmarked Cor-Ten, graffiti, corrosion-marred bronze, and muddy footprints all distract from the conceptual nature of the monumental banal. Three editions of one artwork—in different settings and with different treatment histories—have over the course of four decades been subjected to efforts to create a balance of acceptable deterioration with respect to the artist's vision and preservation of an artwork as an investment or permanent member of a collection and community.

The sculptures, their locations, and the conservators who treated them are as follows: 1) Edition 1 of 3, at Oberlin College, Allen Memorial Art Museum, Oberlin, Ohio, treated by Mark Erdmann of ICA–Art Conservation; 2) Edition 2 of 3 at the Saint Louis Art Museum, St. Louis, Missouri, treated by Russell–Marti Conservation Services, Inc.; and 3) Edition 3 of 3, originally created for the private collection of David Pincus and now at the Philadelphia Museum of Art, treated by Adam Jenkins of Milner+Carr Conservation.

Per the artist's instructions, the sculptures, intended for outdoor display, were partially buried in the ground as part of their installation. Contact with the earth resulted in accelerated corrosion of the Cor-Ten steel; in addition, the welds between

the bronze prongs and the Cor-Ten body of the plug were sites of severe corrosion on two versions of the sculpture. Above ground portions of Cor-Ten weathered differently due to water run-off, prevailing wind, overhanging limbs, snow and leaf accumulation, and public interaction with the artwork.

This presentation explores the deterioration of each of the three sculptures prior to conservation treatment and the conservators' differing approaches to treatment of similar issues. Where applicable, earlier conservation treatments of each of the sculptures are briefly discussed as well.

Innovations During Renovations: Evolving Technologies and New Materials for an Encyclopedic University Museum

Carol Snow, Deputy Chief Conservator, Yale University Art Gallery

Founded in 1828 as the country's first college art collection, the Yale University Art Gallery recently completed a phased, fourteen-year renovation and expansion to reverse over 280 years of accumulated, deferred maintenance. Guided by Art Gallery Director Jock Reynolds, New York's Ennead Architects elegantly reunited three distinctly different buildings—the 1866 Ruskinian Gothic Street Hall originally built as the Yale Art School, the 1928 Italianate Gothic Old Yale Art Gallery, and the 1953 Louis Kahn building—as part of Yale University's Master Plan for the Arts Area serving Yale, New Haven, and visitors from around the world. At a cost of \$135 million, the project increased exhibition space by 73% allowing over 4,000 works of art to be displayed, and created new study galleries and classrooms to fulfill the teaching museum's mission “to encourage appreciation and understanding of art and its role in society through direct engagement with original works of art” (<http://artgallery.yale.edu>).

During the latest phase of renovations, the Conservation Department was tasked with treating over a thousand objects from eleven curatorial departments in less than three years. Support from interdepartmental museum staff allowed research and development of new materials and techniques for major installations and conservation projects. Treatments ranged from high precision, dry removal of tons of reinforced concrete to passive preservation of experimental materials used by living artists. This presentation spotlights ancient to contemporary conservation projects: a Roman mithraeum and horse armor, a Byzantine floor mosaic, an 18th century period room, Indo-Pacific textiles, an Indian teak archway, a John La Farge stained glass window, Marcel Duchamp's Rotary Glass, and Matthew Barney's petroleum jelly sculpture. Collaborations with engineers, fabricators, art handlers, exhibition designers, and curators made innovative use of evolving technologies. New applications of 3D scanning, CNC (computer numeric controlled) machines, and composite materials redefined reversibility and restoration and offered new options for collection display and collection sharing.

Beyond the Visible: Macro and Micro Analytical Forensic Imaging for the Documentation and Investigation of Archaeological Objects

Alexis North, Second-Year Student, UCLA/Getty Program in the Conservation of Archaeological and Ethnographic Materials; and Dr. Ioanna Kakoulli, UCLA Materials Science and Engineering Department & Chair, UCLA/Getty Program on the Conservation of Archaeological and Ethnographic materials

Digital analytical imaging utilizing the properties of visible (Vis), ultraviolet (UV), and infrared (IR) light has become a standard documentation and diagnostic tool used by conservators and art historians not only to create a record of an object's appearance and condition, but also to uncover its method of manufacture, history, and previous conservation treatment. This non-invasive method has enabled the examination of a variety of objects of different geometry, complexity, and value providing useful information not discernible with the naked eye. Recent advancements in the medical and forensic imaging fields have led to the introduction in conservation of improved methods in the examination and documentation of objects of archaeological, historical, and artistic value.

This paper discusses the application of a forensic alternate light source (ALS) with tunable light capabilities for the analysis of objects under specific wavelengths of light and illumination conditions. Combining the tunability of the light source with longpass, shortpass, and bandwidth filters positioned in front of a modified DSLR camera in which the UV/IR blocking filter has been removed, an object is analyzed using reflectance and fluorescence imaging at the spectral range between 350 nm (ultraviolet-UV) and 1000 nm (near infrared-NIR). From the monochromatic images captured, false-color reconstructed trichromatic images including UV and IR false-color images can be obtained, enhancing specific features not easily discernible in the original black and white images, and assisting in the qualitative identification of certain materials.

The results obtained from this versatile approach show that augmenting analytical imaging with forensic technologies is an invaluable first step in the examination of objects, being an excellent tool for screening and preliminary characterization of materials. For example, reflectance in the UV and luminescence in the visible and NIR were performed on an ancient ceramic with a highly obscured surface, revealing long-lost decoration not visible in standard UV-induced visible fluorescence or NIR reflectance imaging. Issues of authenticity in a law enforcement setting were also resolved with the discovery and identification of traces of ancient paints based on their specific visible and infrared fluorescence emissions.

Bringing History to Life: Reproducing a Worthington Steam Pump from the USS *Monitor*

William Hoffman, Conservator, USS *Monitor* Project, The Mariners' Museum®

On December 31st, 1862, the USS *Monitor* sank off the coast of Cape Hatteras, North Carolina, taking to the ocean floor a complex mechanical steam system, which included two direct-acting steam pumps designed and built by the H.R. Worthington Company in Brooklyn, New York.

In 1973, the *Monitor's* wreck site was discovered in 240 feet of seawater, and in 1975, the site fell under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA), which currently oversees, protects, and studies the wreck. Over the past three decades, NOAA, with the assistance of the US Navy, has recovered over 200 tons of material from the site, including the two Worthington pumps in 2001.

Since 1987, when it was designated as the repository of all *Monitor* artifacts, The Mariners' Museum in Newport News, Virginia, has been conducting conservation on recovered objects to stabilize and preserve them for eventual display and curation. As deconcretion and conservation treatment began on the Worthington pumps, much of the artifacts' original surfaces were exposed, which not only enabled the advancement of the treatment process but also revealed machining, file, and casting marks left on the objects from the manufacturing process. Also, through the use of x-radiography, loss due to years of corrosion as well as structural weakness to some of the surviving components soon became apparent.

As the conservation treatment of the pumps progressed, discussion on final display also began, which led to further dialogue on how to visually convey to the public the pumps' movement. By conservation ethical standards and from structural loss and weakness, operation of either original pump is not possible, so the use of a 3-D model was suggested. However, it was felt that a computer-generated model could never fully represent the impact of a live-running steam pump. Therefore, in 2010, Mariners' Museum conservators began a project to create an operational replica of the pumps using multiple molding methods, laser scanning, computer-aided drafting (CAD), fused deposition modeling (FDM), and several casting and machining techniques.

This paper will provide an overview of the methods and challenges of reproducing a variety of pump components using both modern and traditional casting methods aided by the interpretation of foundry marks that remained on original components. Furthermore, it will describe the outreach potential of a project of this scale and how it has been used to attract new audiences, gain donor support, and spread awareness about the need for conservation.

Preserving an Aesthetic of Decay: Living Artists and the Conservation of Contemporary Objects

John Campbell, Conservator, Art Conservation Group

The artist/conservator collaborative process is an important and emerging area of conservation focus. The purpose of this paper is to examine the conservation of contemporary works in the context of the artist/conservator collaboration with the goal of preserving an artist's legacy.

First, an overview of common opportunities and challenges facing contemporary object conservators who work with living artists will be presented. For example, the artist can be used as a primary source when researching treatment options, providing insight into intention, aesthetic, and materials. Direct contact with the artist may alleviate guesswork inherent to the practice of conservation. However, artists returning to works created several decades earlier may incorporate current thought about aesthetics and construction in their advice. The conservator must strive to utilize the artist's input without altering the original intent of the object.

Next, specific materials issues will be discussed using the work of James Magee as a case study. Magee is a Texas-based artist known primarily for a decades-long project called *The Hill*—a site-specific architectural installation in the desert outside of El Paso providing a sensorial experience for the viewer. *The Hill* is composed of a wide array of materials, including local shale, steel, bone, lead shot, hibiscus and found objects. Thus, *The Hill*, as well as Magee's smaller objects, provides a unique opportunity to examine the role of the conservator in preserving the material aspect of a body of work—one that aims to explore beauty through the process and product of decay—by an artist who recognizes that maintenance is a distinct aspect of his work. Another area common for contemporary conservators is preserving the immaterial aspect of works. In Magee's case, the titles of objects, often pages in length, are integral to the viewers' experience of the piece itself. The conservators' role in documenting (e.g. recordings, textual description) and maintaining these essential "spoken word" elements of the work is discussed. The collaboration between the conservator and artist is also examined based on ethical issues that arise.

The paper concludes with a special emphasis on documentation as a tool to bridge the caretaker roles of the conservator and the living artist.

Intersecting Conservation Approaches to Ethnographic and Contemporary Art: Ephemeral Art at the National Museum of African Art

Stephanie E. Hornbeck, Principal and Senior Conservator, Caryatid Conservation Services, Inc.

At the Smithsonian's National Museum of African Art (NMAFA), conservators apply our experience with preserving ethnographic materials to contemporary works in the collection, and vice versa. While contemporary African art shares significant aspects with global contemporary art trends, materials, and media, it has become apparent to conservators, who work with ethnographic materials, that contemporary objects also share many characteristics with tradition-based objects. These include: the use of composite media on a single object; the use of re-purposed materials; the use of fugitive materials; and the elaborate constructions of temporal installations. My conservation colleagues Steve Mellor, Dana Moffett and I at NMAFA have found that the ethnographic conservator's repertoire and familiarity with the wide range of materials found in anthropological collections is readily applicable to aspects of the conservation of contemporary art. Drawing on a number of African tradition-based and contemporary objects case studies, this paper aims to present an overview of the key conservation issues and challenges that ephemeral media have presented at the Museum.

The permanent collection of the National Museum of African Art includes both tradition-based and contemporary objects, which sometimes employ fugitive materials or media that render them ephemeral. Among these exists a smaller grouping of objects which are ephemeral by design. To comprehensively fulfill its mission to collect and preserve the visual arts of Africa, NMAFA began acquiring contemporary works in the 1990s, while continuing to collect tradition-based art. The Museum has subsequently amassed the largest public collection of contemporary African art in the United States. Since 1997, a large gallery has been devoted to contemporary African art, in which rotating exhibitions are always on view.

Ephemeral materials pose challenges on conceptual and practical levels to the conservators faced with their display, treatment, and preservation. Indeed, the concept of ephemeral-by-design stands in direct opposition to the major tenet of conservation: the preservation of cultural patrimony for future generations. The conservation challenges inherent to ephemeral art have been addressed by a number of conservation conferences and attendant publications. Issues of unpredictability, permanence, and deterioration processes particular to ephemeral materials, as well as particular legal and ethical conservation considerations, have been widely discussed by conservators.

Working with art created by living artists, as we navigate between the sometimes-competing demands of preservation of the physical art work and respect of artistic intent, involves complex issues. These may include: artistic intent, conservation ethics, historicity, authenticity, functionality,

exhibition installation, and the preservation of original materials vs. (sometimes) complete restoration. The conservation process can be protracted, involving an interdisciplinary team consisting of conservators, conservation scientists, curators, anthropologists, artists, artisans, studio assistants, fabricators, and gallerists.

The ethnographic object conservator's wide knowledge of materials is particularly suited to the conservation of categories of contemporary art and we look forward to continued collaborations with our conservation colleagues, who focus on contemporary art. This paper's juxtapositions of African tradition-based and contemporary art examples will address these topics: the challenges of the ephemeral-by-design concept; the complexity of contemporary installations; the conservator as artist's surrogate; and both shared and divergent aspects of ethnographic and contemporary art conservation, as applied to ephemeral art.

Restoring the Immaterial: Using New Media to Communicate Context

Sarah Barack, Samuel H. Kress Fellow in Technical Art History at the Yale University Art Gallery; and Beth Edelstein, Associate Conservator, Department of Objects Conservation, Metropolitan Museum of Art

As conservators, we necessarily immerse ourselves in the material nature of artwork. This focus ranges from active stabilization of the work to passive intervention—always holding the physical concerns of the work paramount. These efforts have an ambitious goal: to preserve the creator's original intent, or, as is often the case with archaeological or ethnographic objects, to preserve information that communicates an object's original use or purpose. Yet, however present the actual work of art may be, our efforts are challenged by the incontrovertible fact that often, the intangible aspects of the work's creation are necessarily lost when the object is removed from its original context, or when that context itself evolves over time.

Conservators approach this challenge in a number of ways, including developing guidelines to help return an historic interior to its appearance at a particular time; advising institutions on how to display objects in ways sympathetic to original context; or providing external information about the object's creation to the viewer. These solutions all attempt to communicate the environment in which the object was created, or even the environment in which it lived for centuries before coming to light in our time.

Today, new media tools, for instance interactive tablet applications, podcasts, videos, and even augmented reality, offer an effective means by which context might be suggested in experiential, holistic ways. Such didactics can be thought of as a more conceptual restoration, one that approaches the object from other vantage points than its materiality. The information available to the conservator's eye is crucial to these efforts, as the physical traces of the object's past environments are readable on its surface, and the details of an object's creation so often reveal the thoughts, influences, and unique approaches of its creator. For

an audience accustomed to seeing art objects cleanly divorced from their original context, this information places the object back into the real world and thus allows an entirely different experience.

Our first foray into this realm has involved partnering with educators who make short videos focusing on bringing art objects back into the “real” world, and relating their stories and context. This collaboration has great promise, as the information we provide broadens this recreated context in new and engaging ways. But it is clear that conservators and many other professionals around the world have avidly embraced new media tools for this purpose. We propose to both present our experience to date and also gather the stories of others working in this area to give the Objects Specialty Group audience an overview of current efforts to contextualize objects. Examples might include the simulated

location and original lighting conditions of liturgical sculpture, or the use of 3D imaging to virtually place the sculpture back in its intended niche, or interactive recreations of fragmentary archaeological objects, structures and sites. Emerging partnerships encouraged by conservators’ involvement in recreating context will also be considered—with web developers, graphic designers, archaeologists, engineers, and especially educators and curators. Finally, we also aim to discuss briefly some of the theoretical questions that arise from this topic. Is providing a generally accurate, though perhaps not perfectly interpreted, context better than providing none at all? Where do we draw the line between “Disneyfication” of art objects and the provision of a human context for them? The overall goal will be to engender discussion of the possibilities for conservators to participate in a “virtual” conservation of an object’s context and life.

PAINTINGS

The Research and Conservation Treatment of *Jar of Apricots/le bocal d'abricots*, 1758 by Jean-Siméon Chardin

Sandra Webster-Cook, Conservator of Paintings, Art Gallery of Ontario; Lloyd De Witt, Curator of European Art, Art Gallery of Ontario; Kate Helwig, Senior Conservation Scientist, Canadian Conservation Institute

This remarkable still-life by Chardin is one of the great masterpieces in the collection of the Art Gallery of Ontario (AGO). It is a rare oval by Chardin and is very significant as one of a pair presented by Chardin at the Salon of 1761. The companion painting, *The Cut Melon* is in a private collection. The research and conservation of the AGO painting was sponsored by the BNP Paribas Foundation.

The painting was generally in stable condition but suffered from at least two generations of harsh restoration treatment. There are drying cracks in many areas and extensive mechanical cracking of the paint layers which appears to be stabilized by an old glue lining. Restoration treatments of the damaged areas of the paint surface have altered the forms and colors of the original. The synthetic varnish (EVA co-polymer) had deteriorated and lost its transparency resulting in incomplete saturation of the dark colors especially.

Prior to treatment, noninvasive analysis of the painting was carried out by scientists from the Canadian Conservation Institute to document the artist's materials and assist in the interpretation of early retouching in the consideration of their removal and separation from the original surface. Noninvasive Raman spectroscopy and x-ray fluorescence spectrometry provided information about the paint composition in many areas. Some samples were removed during the course of the treatment and analyzed by Fourier transform infrared spectroscopy, polarized light microscopy, Raman spectroscopy and scanning electron microscopy/energy dispersive spectrometry to provide more detailed compositional information.

Following the initial phase of study, the painting was loaned to the Chardin exhibition in Ferrara and Madrid (2010-11). Examination of comparable works assisted in the understanding of Chardin's materials and techniques and served as important reference material in the cleaning and reconstruction of damaged areas. The venues also permitted consultation with Chardin scholars.

The painting required a sensitive cleaning (removal of the synthetic varnish and removal of most of the old restoration retouchings). After the brush application of a stabilized natural resin dammar varnish, the abraded and damaged areas were reintegrated by retouching with B72 and dry pigments, in consultation with our Curator of European Art, Lloyd De Witt and in reference to similar works by the artist and accumulated research.

The lengthy and complex treatment has been very successful and has revealed unexpected color. The painting has recovered a greater sense of depth, and more subtlety of color and texture throughout. There is unity of tone, color and form central to Chardin's aesthetic. Chardin's interest in the effects of light,

transparency and reflection is clearly evident and the quiet beauty so characteristic of his work is recovered.

The Treatment of Efflorescence and Pollution-Darkened Water Sensitive Paint in the Vanka Murals of St. Nicholas First Croatian Catholic Church

Rikke Foulke, Paintings Conservator in Private Practice

The St. Nicholas First Croatian Catholic Church, located in Millvale, Pennsylvania, a borough neighboring Pittsburgh, contains expansive murals painted by the Croatian immigrant artist Maximilian Vanka in the 1930s and 1940s. Pictorial content in the 22 murals covers 11,000 square feet of interior space and depicts scenes of industry, religion, social injustice, and the horrors of war. In the 75 years since their completion, the murals have been subjected to a variety of damage.

A hurricane in 2004 struck the building, resulting in water infiltration in the walls and the development of local areas of efflorescent bloom on the murals. Further, pollutants from industry and auto emissions have resulted in darkening colors of the surface of the murals. This case study addresses shortcomings of previous treatment materials, treatment of efflorescence using inorganic materials designed for murals, and removal of dirt from the water-sensitive surface by using new materials designed for the conservation of modern paints. Samples collected from untreated efflorescence were examined by scanning electron microscopy—energy dispersive spectroscopy (SEM/EDS), identifying a strong presence of sulfur in the salts. The presence of sulfur supported the application of the inorganic method, known in Italy as the “barium method” or the “Ferroni–Dini Method,” to chemically de-sulfate the efflorescence and re-form calcium hydroxide by the use of poultices. Test areas were examined using SEM/EDS before and after poultice application to confirm the reformation of calcium in the wall.

Once the efficacy of this method was supported, nanoparticles of both barium and calcium were used for improved results. SEM/EDS of samples collected from areas treated by nanoparticles confirmed that sulfates were removed from the surface and stabilization of the wall was successful. Cleaning the water-sensitive medium was handled using recently developed cleaning systems. Aqueous mixtures were adjusted to a lower pH and water/oil emulsion gels were designed to prevent water from penetrating the sensitive surface while lifting surface dirt.

Assembly-Line Conservation for the Recovery of Haitian Paintings

Viviana Dominguez, Wall and Easel Paintings Conservator

Every single painting to be conserved in the “atelier” at the Haiti Cultural Recovery Center (SIHCHR) was severely damaged

and in need of urgent care. The overwhelming and scary sight of these wrecked paintings, dug out from the rubble after the 2010 earthquake in Port-au-Prince, never intimidated the 14 AIC Professional Conservators that worked in the first International Smithsonian Institution project.

The author of this paper was contracted by the Smithsonian Institution to work and oversee activities at the SIHCHR paintings conservation studio. Stephanie Hornbeck, the project's chief conservator, handed me the list of paintings to be conserved as well as those with treatment in progress. Due to budget constraints, I found myself having to rapidly adapt to the two-week on-site and two-week back in the US working schedule while following up on treatments started by previous conservators. With the help of AIC P/A volunteers, I was able to implement an 'assembly-line' conservation program. I would meet with one of the volunteers during one week of my stay to discuss the work, agree upon and perform treatments together. The baton would then be handed to the conservator who continued the work with the local assistants. Discussions among the volunteer conservator and I regarding treatments would continue over the Internet. Two weeks later, back in Haiti, I would pick up the baton to continue the treatment on the various paintings and get the work ready for the next conservator volunteer.

While conducting very complex treatments we were also able to train three skillful and dedicated Haitian artists and art teachers at the *Ecole Nationale des Arts* (ENARTS), who assisted in the project. In the course of four months, the team efforts were reflected on the sixteen Haitian paintings that were recovered from the disaster.

In this paper, I will describe the assembly-line conservation process used in the successful restoration of the paintings that originally were in such a deteriorated state that it would have been a formidable challenge for any laboratory in the world. I will present the case study of a selected group of paintings from some Haitian leading modern and contemporary artists. Some of these paintings include Mario Benjamin's *Portrait of an Old Woman* recovered from the National Palace in five pieces, Stevenson Magloire's painting representing Jean Bertrand Aristide as a priest, brought to the Center in eight pieces, and Max Pinchinat's *Portrait of Lady*.

Traditional treatments met innovative methods. There were many cases where the lack of materials or proper equipment forced us to be very creative. We faced other challenges like compensating for large losses while at the same time acknowledging their historical value as a result of the 2010 earthquake that so deeply affected Haitian culture.

Richard Caton Woodville: In Palette and Process

Eric Gordon, Head of Paintings Conservation, The Walters Art Museum; and Gwen Manthey, National Endowment for the Humanities Fellow, The Chrysler Museum of Art

Richard Caton Woodville created what became some of the

most iconic images of antebellum America while working from abroad. His early education in Baltimore coupled with his studies at the Düsseldorf Academy instilled in him a fairly traditional, conservative painting methodology. By identifying his painting materials and the process involved in creating his compositions, we can appreciate how he transformed his vision of American life onto canvas.

Woodville illustrated a precise moment in America, captured growing up in Baltimore and interpreted from Europe, with paint on canvas using specific materials and techniques. To understand how Woodville turned his ideas into images, conservators and scientists at the Walters Art Museum, Baltimore, began examining the majority of the artist's paintings while preparing for the first major Woodville exhibition in almost 50 years, opening in Spring 2013. With sixteen paintings known to exist, the artist's oeuvre is small, making it possible to draw some general observations on his materials and his precise, miniaturist-like technique. Scientific analysis of all of the paintings identified the artist's materials and deciphered the methods and techniques involved in making these complex paintings. The findings from the Walters research will be presented to illustrate how his traditional working methods and materials were enhanced with new and sometimes expensive pigments very recently introduced into the marketplace. X-radiographs, infrared imaging, cross-sectional analysis, fluorescence transformation imaging reflectance, scanning electron microscopy (back-scattered emissions, electron dispersive spectroscopy), gas chromatography-mass spectrometry, x-ray fluorescence, electron dispersive spectroscopy, Raman spectroscopy and microscopic examination identify Woodville's painting materials and reveal the artist's skillful working practice. Collaboration with Dr. John Delaney of the National Gallery of Art allowed us to image the paintings using a Santa Barbara Focalplane with an InSb detector, identifying changes that remained hidden despite examination with other analysis.

Woodville's paintings were very carefully composed to project the artist's keen perception of American life. The genesis of his finished compositions can be understood by examining a small number of seminal drawings and watercolors that were made as preparations for his major compositions in relation to the newly discovered infrared and x-ray images. By comparing these preparatory sketches, underdrawings (as seen in infrared images), *pentimenti* (changes in the paint layers as detected in x-radiographs) and cross-sections to the final painting, we are able to see the actual step-by-step transformation. By sensitively rearranging figures, objects and compositions, the artist subtly changed the meaning in his paintings, including the celebrated *War News from Mexico*, recently acquired by the Crystal Bridges Museum.

Combining scientific analysis of materials and techniques with visual evidence as seen in the artist's preparatory work helps us to understand the evolution of Woodville's American genre scenes. As an American painting from abroad, he displayed remarkable insight and unveiled an acute awareness of social and political events, transforming his ideas to images which became American icons.

Experimental and Innovative: Matisse Paintings from the Wertheim Collection

Gabriel Dunn, *Paintings Conservator*

Henri Matisse was one of the great pioneers of modern European painting. His body of work from 1913–17 has been referred to as his most experimental and innovative due to his use of a subdued palette that included the use of black, and a varied working technique comprised of complicated layering due to compositional revisions (D'Alessandro & Elderfield 2010). Two of his paintings from the Fogg Museum's Wertheim Collection, *Geraniums*, 1915 and *Still-Life with Apples*, 1916, were subject to a technical analysis in order to understand the materials, development, and structure of these significant works and to determine whether or not they displayed the characteristics of the 1913–17 period.

With the aid of infrared reflectography (IRR), infrared digital photography (IRDP), and x-radiography it was concluded that *Geraniums* had slight variations from its contour underdrawing while *Still-Life with Apples* had significant compositional revisions. X-ray fluorescence (XRF), Fourier transform infrared microspectroscopy (FTIR), and scanning electron microscopy energy dispersive spectrometry (SEM-EDS) identified a limited, subdued palette for *Still-Life with Apples* and a diverse, bright palette for *Geraniums*. Cross-section analysis with reflected light microscopy (RLM) supported by examination of the painting under magnification revealed complicated paint stratification in both works as well as striking changes in color combinations. A water-soluble red paint containing carbohydrate inclusions was identified in *Geraniums* in cross-section analysis and FTIR. The carbohydrate component may have been an additive in the paint; however further analysis is necessary to identify its function. The construction sequence of both paintings was hypothesized using digital image manipulation in order to visualize the various stages of the paintings as Matisse may have created them. Based on the technical analysis with support from archival information, it was concluded that *Still-Life with Apples* displayed characteristics of the 1913–17 period and *Geraniums* did not exhibit the same characteristics as *Still-Life with Apples*, and with supportive archival information from Bernheim-Jeune, dates to approximately 1910.

Both paintings had non-original synthetic varnishes noted in the conservation files and identified with FTIR analysis. Varnish removal was proposed due to the poor aging of the synthetic varnishes, which had altered the original aesthetics and surface quality of the paintings. Treatment of *Geraniums* involved removing the non-original synthetic varnish and returning it to a more original state. While solubility testing was performed on *Still-Life with Apples* and testing confirmed that brush strokes and more accurate colors would be revealed, curators decided not to proceed with this treatment due to the dramatic change that would occur to the appearance. A second treatment option was chosen including slightly reducing the varnishes with TS-28, filling and inpainting abrasions along the perimeter of the painting, and toning the painted border to match Matisse's

original color. Further conversations with curators are necessary to identify whether or not the date of *Geraniums* will be changed based upon the collected data and archival information.

What Lies Beneath: The Textural Influence of Grounds on Diego Rivera's Cubism

Joanne Klaar Walker, *Conservator in Private Practice*

Whether in portraits or still lifes, Diego Rivera strove to create complex surfaces in his Cubist works, employing a variety of techniques to achieve them. Between 1913 and 1917, Rivera's forays in Cubist painting yielded dozens of images marked by a significant interest in textural variation. Based on the results of a technical study of thirty-four paintings from this period examined by the author while she was the William R. Leisher Fellow in Modern and Contemporary Painting Conservation at the National Gallery of Art, this paper will explore Rivera's creative use of grounds to produce topographic variations uncommon in his paintings up to this point in his career. The techniques used to create these textures were influenced by Rivera's academic training in Mexico and the materials he was taught to use there. Most important in his development, however, were Rivera's years spent in Europe and the artists with whom he came into contact.

As Pablo Picasso and Georges Braque's dealer Daniel-Henry Kahnweiler predicted in his *Der Weg Zum Kubismus* in 1920, "every talented young artist will have to come to an understanding with Cubism." Rivera did just that, borrowing the vocabulary devised by those two artists. However, Rivera's experiments with Cubism also marked the first time that he developed his own methods of painting, creatively applying grounds to create considerable topographic variation in his upper layers of paint. Rivera's Cubist works represent a transitional period in his career, a turning point from his academic training to his later life as a mural painter. His experimentations with Cubism sparked an inventive streak in Rivera that extended beyond his time in Europe. By the time he returned to Mexico in 1921, Rivera had become an artist with a unique vision and an arsenal of painting techniques that he would utilize throughout the rest of his career.

Hans Hofmann's Last Lesson: A Study of the Artist's Materials in the Last Decade of His Career

Dawn Rogala, *Doctoral Candidate, Preservation Studies Program, University of Delaware*

In 1992, art historian and University of California, Berkeley professor T.J. Clark gave a public lecture based on the university's renowned collection of Abstract Expressionist art. "What you're going to hear tonight is a defense of Abstract Expressionism,"

began Clark, “[and] if there is to be a defense of Abstract Expressionism at all . . . it will have to be cast as a defense of Hofmann in particular . . . [for he is] the trigger for the line of argument I’m going to present.”

Hans Hofmann (1880–1966) was intellectually and physically situated at the nexus of Abstract Expressionist experimentation. For more than four decades, artists and critics from around the country came to hear Hofmann’s synthesis of modern art movements in his “push and pull” theory of color and form. Art critic Clement Greenberg claimed to have been educated by Hofmann, Greenberg’s ideological opponent Harold Rosenberg claimed Hofmann as the first of his “action painters,” and the Museum of Modern Art called Hofmann the “dean of the abstract-expressionist movement.” With students positioned at the forefront of art movements and institutions throughout the United States, Hofmann is a thread running throughout Abstract Expressionism, tying its participants to the efforts of their progenitors and descendants, “which is to say,” according to artist Frank Stella, “all of the twentieth century.”

Hofmann’s popularity as a teacher peaked in the 1950s, a period when his own painting flourished and a new wave of innovation in paint manufacture led to radical shifts in art making. Many of the condition problems conservators face in the treatment of modern paintings first appear in Abstract Expressionist work, and Hofmann is an excellent mirror of this unique historical moment.

Building on the author’s research that revealed incompatibility problems in the incorporation of new materials by Hofmann and his Abstract Expressionist colleagues, this new research tracks Hofmann’s use of materials during the ten-year period just prior to and after the 1958 closing of Hofmann’s schools in New York City and Provincetown, Massachusetts. Using analytical data gathered from the analysis of over 500 paint and fiber samples, this presentation will trace Hofmann’s embrace of industrial paint binders and modern organic pigments, focusing on relationships between the artist’s late-career materials, style, and the impact of these choices on the long-term stability of Hofmann’s work.

Modernizing Stretchers for Paintings on Canvas

Jia-Sun Tsang, Senior Paintings Conservator, Don Williams, Senior Furniture Conservator, and Inês Madruga Carvalho Caldeira, Paintings Conservation Fellow, Smithsonian Institution’s Museum Conservation Institute (MCI); Rick Pelasara, Exhibit Production Manager, Smithsonian National Museum of the American Indian

Stretchers for paintings on canvas first appeared in the mid-18th century. Since then, a variety of devices have been used to expand the corners of stretchers to create tight, even surfaces. These devices have included traditional wooden wedges, modern ICA spring stretchers, and expansion bolt stretchers, all employed to impose dimensional changes at the corners. If not used properly, this type of expansion through corners can harm works of art

by concentrating excess stress at corners, along with many other concomitant risks.

Previous MCI-based research into the mechanical behavior of paintings, combined with the authors’ experiential observations, provided the impetus to develop an innovative stretcher system that would provide strong, even, reliable support for a canvas without expanding the corners. We have developed a prototype stretcher made of aluminum and Delrin® (an engineered polymer with properties bridging the gap between metal and wood), with threaded thumb screws for tension adjustment positioned at calculated intervals along the stretcher bars, not at the corners. This system has several advantages: it can adjust the tension in each direction and location separately; it provides stability and even tension while conserving aged and lined paintings; and it effectively corrects planar distortions through infinitely variable localized tension adjustments.

This new system can be adapted to serve as an insert for retrofitting extant paintings with lax, nonplanar canvases that cannot be safely dismantled, and also as a new stretcher for original artworks. The prototype stretcher can be retrofitted to an existing painting to impart structural strength and integrity without imposing any new stresses or distortions on the extant stretcher corners. Instead, the stresses and concomitant strains are introduced along the bars of the stretcher, in effect allowing the corners to “float” and achieve their own structural equilibrium. This feature is even more pronounced in the prototype stretcher developed for new paintings, in that the intersections of the wooden tacking bars allow for the structural equilibrium required by the canvas. The use of this innovative system with modern and contemporary large-scale paintings has significant ramifications: besides providing structural soundness and even surfaces, adjustments and corrections of canvas tension can be made on-site in galleries and museums, without having to dismount the paintings.

As an example of this new stretcher’s practical application, to treat a 150-year-old painting with severe planar distortion and a fragile surface sensitive to moisture and heat, our team designed and installed a prototype as an insert. Fitting the at-risk painting with our newly designed stretcher immediately corrected the severe planar distortion of the canvas, without the use of heat, moisture, or weight.

Practical Applications of a Constant Tension Elastic Stretching System

Laurent Sozzani, Senior Paintings Conservator/Restorer, Rijksmuseum; Antonio Iaccarino Idelson, Conservation of Canvas Paintings Professor, University of Urbino; Carlo Serino, Founder, Equilibrarte; Lisette Vos, Junior Paintings Conservator/Restorer, Rijksmuseum

This talk will present the history, development and ongoing research of a constant tension elastic stretching system for canvas paintings. An overview will present examples of various configurations of the system followed by an in-depth case study of its

particular use on two paintings in the Rijksmuseum, *The Battle of Waterloo* (Rijksmuseum SK-A-1115), one of the largest paintings to which the system has been applied and a large oil canvas wall painting, *A Dutch Landscape* (permanent loan Amsterdam Museum BK-2011-42)

Keyable wood stretchers have changed little since their introduction in the 18th century. In the 19th century the first spring systems were applied. But they retained basic corner expansion, and often springs were too strong, thus unable to compress during contraction cycles, leading to damage.

In the 1950s, Roberto Carita, at the Istituto Centrale per il Restauro in Rome, introduced a new principle for elastic spring tension based on a fixed wooden strainer, allowing the painting to expand and contract along the entire perimeter with evenly distributed tension. In the 1990s, Antonio Iaccarino Idelson furthered research on the method and adapted it to the conservation of original stretchers. During research a survey quantifying tension of the same mock-up painting was carried out by over 100 experienced Italian conservator-restorers bringing about a greater understanding of the forces needed in stretching lined and unlined paintings. The use of measured values of tension that can be applied to each painting has brought new relevant information to the field. Iaccarino and Carlo Serino, conservator-restorers in Rome, Italy, have applied this method of elastic stretching to numerous paintings throughout Europe. Different configurations have been applied to large and small, lined and unlined paintings. Both easel and ceiling paintings have benefited by adapting existing stretchers or by utilizing new stretchers.

Treatment of the Rijksmuseum painting, *The Battle of Waterloo*, is a good illustration of the method. The painting was completed in 1824 by Jan Willem Pieneman (1779–1853) as a memorial to the defeat of Napoleon's forces by the allied Seventh Coalition armies under the Duke of Wellington. King Willem I of the Netherlands purchased it for his son the Crown Prince, later Willem II, who was wounded in the battle and is depicted in the painting. Still owned by the royal family, it has been on permanent loan to the Rijksmuseum since its opening in 1883.

The painting is wax-lined and measures 5.67 x 8.23 meters. It is one of the largest freestanding paintings in the Netherlands. In 2002 when the museum closed for renovation the painting was rolled for storage. In 2012 it was restretched and rehung in a newly renovated gallery.

The Pieneman painting had previously been stretched on a traditional keyable wood stretcher. For the restretching, the painting has been attached to a custom-made aluminum constant elastic tension stretcher. Rather than being statically held by tacking, the painting is now mobile, held by springs, which allows the painting to maintain constant tension while adjusting to any dimensional changes brought about by changing environmental conditions.

Tension on a traditional stretcher relies on pulling during attachment and/or keying out after attachment. Keying plays the dominant role with lined paintings and with large paintings keying plays the only role in achieving final overall tension.

Keying then creates irregular tension that focuses bigger forces in the corners of the painting.

A similar system was applied to a large canvas wall painting by Jurriaan Andriessen (1742–1819), dated 1776, depicting a Dutch landscape. It was also wax lined and measured 3.3 x 5.4 meters. This painting had been in storage on a poorly designed roll for over 50 years and was badly distorted. In this case, the picture was first attached to a new keyable wood stretcher, but with unsatisfactory results in reducing the distortions. The stretcher then was adapted to the constant tension elastic spring system and the painting was reattached with greatly improved results.

This type of stretching system has proved useful for the Amsterdam paintings and other case studies presented. The relevance of this new understanding and method becomes clear when considering its influence on stress distribution and potential crack formation. The benefit to paintings in general and to large sized modern paintings should also be recognizable.

The Restoration and Conservation of the Baroque Mechanism and Painting on the Altar of S. Ignazio in the Church of Gesù in Rome

Carlo Serino, Founder, Equibrarte; and Antonio Iaccarino Idelson, Conservation of Canvas Paintings Professor, University of Urbino

This talk presents an intervention of the large painting and the counterweight machine designed to allow its movement during special celebrations, on the altar of St. Ignazio, in the church of Gesù in Rome.

The chapel and its altar are conceived as a “theater” displaying the life and sanctity of St. Ignazio, the founder of the Jesuits. It represents the triumph and glory of the apex of Roman baroque culture. Designed and executed by Andrea Pozzo in 1695–9, it is well preserved and is one of the few remaining important altar machines in Catholic Europe.

Central to the altar is a large canvas painting depicting St. Ignazio. Painted by Pozzo it measures 6.5 x 3 meters. Working as a theater curtain the painting can be lowered to reveal a monumental statue of the Saint originally made in silver, gilt bronze and precious stones. He stands in full glory, housed in the niche behind the painting.

The chapel, completely renovated when Pozzo won a competition held in 1695 for reshaping the left transept, is among the most important creations of the late baroque. It is also decorated with frescoes by Giovanni Battista Gaulli (1639–1709), marble and gilt bronze sculptures by Pierre II Le Gros (1666–1719) and J.P. Théodon (1646–1713), and the splendid bronze balustrade designed by Pozzo. An earlier gilt bronze urn by Alessandro Algardi (1595–1654) conserves the body of the Saint.

The treatment of the painting and altar mechanism had to be addressed on several levels of complexity. Though repaired on numerous occasions much of the original mechanism had

survived and all of its elements were still recognizable. But it had been “lost” to use in a lowered position during the last decades. The goal was to conserve and repair as much as possible, replacing only what was necessary to bring it into working order. Most of the damage derived from natural degradation of materials, but some from problems in the original design. Therefore, a deep understanding of the original structure was crucial, as it was necessary to make some difficult decisions in order to assure future safe and efficient movement of the painting.

The original wood stretcher was conserved with some of the original metal fittings. Only those parts that were too deteriorated to assure safe use were replaced. The same has been done with the counter-weight, pulley and guide rails. Regrettably the main rails, originally in chestnut wood and steel, and the brass wheels that guided the painting through a narrow slit in the stone structure, had to be replaced. Deformation of the rails had pushed the painting against the wall causing severe tears in the canvas during decades of improper use. New stainless steel rails

with runners fitted into the rails with sealed ball bearings have replaced the old rails and wheels.

The painting has been restored, relined and reattached to the original stretcher; however it is now attached only with a spring system placed on the back of the stretcher. This keeps the painting under constant elastic tension with only the minimum amount of force that was considered necessary to hold it in plane. In this case, 2.4 N/cm was the force that assured continuous planar stability of the lined painting. Teflon profiles were added to the edges of the stretcher to allow the movement of the canvas along the entire perimeter, and the painting is now free to expand and contract following environmental variations, avoiding all stress concentrations.

Working within the requirements of the modern church, the movement of the counterweight is now produced with an electric winch. A priest’s push of a button on a hand-held remote control has replaced manpower in raising and lowering the painting, and sensors located at key points assure its safety.

PHOTOGRAPHIC MATERIALS

Conservators as Diplomats: Preserving Ernest Hemingway's Legacy in Cuba

Mary-Jo Adams, Executive Director, Finca Vigía Foundation

Ernest Hemingway lived in Cuba longer than he lived anywhere else—from 1939–1960, one third of his life. His Cuban home, *Finca Vigía* or Lookout Farm, was the only stable residence of his adult life. At the *Finca* he wrote many of his finest works—*For Whom the Bell Tolls*, *Across the River and Into the Trees*, *The Old Man and the Sea*, *A Moveable Feast*, *Islands in the Stream*, and numerous short stories and articles. Hemingway's long and productive life in Cuba is the period that has been studied and understood the least due to the embargo.

Finca Vigía contains original book and short story manuscripts, letters, telegrams, post cards, over 3,000 photographs, his fishing tackle and gun collection, furniture, fine art and map collection, scrap books, and a 9,000 volume library containing rare first editions of his books and those of his contemporaries. Approximately 20% of the books have Hemingway's musings written in the margins. Not only did he write *in* the house, he also wrote *on* its very walls. Preserved under glass on the bathroom wall, are Hemingway's penciled daily records of his

obsession with his weight and blood pressure.

Finca Vigía has been maintained as a museum for the past 50 years. The Cuban Ministry of Culture has cared for the collections admirably under difficult conditions. Despite diligent efforts, they did not possess the financial or technical resources to maintain the home and its contents. Derelict and distressed, *Finca Vigía* and its collections were in danger of destruction from heat, humidity, pests, and the sheer passage of time. A United States non-profit, The *Finca Vigía* Foundation, was founded 10 years ago to preserve Hemingway's legacy in Cuba. The Foundation has established an unprecedented collaboration between Cuban and U.S. governments to conserve the Hemingway documents and completed the architectural preservation of the main house.

With very little money, and in the midst of a dauntingly difficult political climate, this project has flourished, grown, and won international acclaim. The binational collaboration has been cited as a “harbinger of better times” by both governments. Throughout the past decade, the Foundation has brought U.S. conservators to Havana—including specialists in architecture, engineering, books and paper, metal, photography, textiles, taxidermy, and digital imaging—to offer advice and provide conservation trainings.

Examination, Technical Study and Treatment of Funerary Stelae from the Roman-Egyptian Site of Terenouthis

Caroline Roberts, Graduate Intern, Antiquities Conservation, J. Paul Getty Museum; LeeAnn Barnes Gordon, Sherman Fairchild Fellow, Museum of Fine Arts Boston; and Cathy Selvius DeRoo, Research Scientist, Conservation Department, Detroit Institute of Arts

This paper describes the examination, technical study and treatment of a group of limestone funerary stelae from the Graeco-Roman Egyptian city of Terenouthis. Excavated in 1935 by the University of Michigan, the necropolis of Terenouthis yielded hundreds of tombs, each adorned with a limestone grave marker, or stela. Each stela was carved with a figure of the deceased, a Greek inscription of their name, and Pharaonic deities and symbols. Approximately two hundred of these objects were brought to the Kelsey Museum of Archaeology following the University's single excavation season at Terenouthis. Today, the stelae continue to serve as important sources of information to students and scholars and some are featured in the Museum's new exhibit wing.

A recent condition survey of the stelae collection found that the artifacts have undergone significant deterioration since their arrival at the University over 75 years ago. Stone delamination, surface powdering, biological staining, and a peeling, darkened coating—originally applied to help preserve the stelae—were observed. A study was carried out in order to identify the agents of deterioration and develop a protocol for treatment and long-term preservation. The aim was to understand the factors involved in the stelae's complex, interrelated deterioration phenomena. Initial examination and spot tests yielded important information, pointing to the actions of soluble salts, biofilms, and an aging nitrocellulose coating.

These observations were confirmed by chemical and instrumental analysis conducted in collaboration with scientists at the Detroit Institute of Arts and the mycology and electron microbeam analysis laboratories of the University of Michigan. Analytical techniques including Fourier transform infrared spectroscopy (FTIR), portable X-ray fluorescence spectroscopy (XRF), X-ray diffraction (XRD), specimen culturing and DNA analysis were used to confirm the presence of soluble salts, characterize the stone, and determine the exact nature of the biological growths seen on many stelae. XRF and XRD analysis were also used to characterize traces of polychromy, including the green earth mineral celadonite, a pigment not often observed in Egyptian art.

A contingency-based treatment protocol was designed to address identified condition issues, with the understanding that each stela is affected to varying degrees by the observed forms of deterioration. The protocol includes recommendations for stone consolidation and structural stabilization, poultice desalination, coating reduction, and biostain reduction. In an effort to use materials that are compatible with the limestone, consolidation was carried out using calcium hydroxide nanoparticles (CaLoSil®) in n-propanol. Environmental parameters have been developed based on the equilibrium relative humidities of salts

that were characterized, and on environmental monitoring data from the stelae's climate-controlled storage and display spaces.

This project, which developed a flexible plan to preserve a large collection of artifacts and incorporated materials and techniques used in non-objects specializations, represents a contemporary, collaborative conservation approach—one that makes the best use of limited resources and looks to professional allies for ideas and support.

Artificial Aging of Paper-Based Cores Wrapped in Various Isolating Layers for Use as Archival Storage Supports

Amy Williams, Conservator, University of Pittsburgh; and Catherine H. Stephens, Yale University

In this study, the effect of artificially aging paper rolled onto support cores wrapped with isolating materials was examined. Oversized paper artifacts often cannot be stored flat due to their size. Therefore, these artifacts may be rolled onto a paper-based support core, which itself is wrapped with a barrier material for use as a space-saving and long-term archival storage solution. A paper-based support core is made up of a series of paper sheets spiral wound onto one other and bound with an adhesive.

Two of the cores chosen for this study were identified as being archival, implying a paper artifact can be rolled directly onto the core for long-term storage without detrimental effect. While both support cores were manufactured with paper that complied with the archival standards outlined by the Library of Congress, one core was bound using sodium silicate while the other was made using a proprietary blend of polyvinyl alcohol (PVOH) and polyvinyl acetate (PVA).

The second two cores were identified as being non-archival. However, they were included in this study as they are occasionally used by conservation professionals. One support core was comprised of kraft paper and an unknown adhesive (supplier not able to identify) while the other consisted of recycled paper and a PVA/acrylic based adhesive. Five isolating layer materials were selected: a polyethylene non-woven film (PE), a multilayered film comprised of polyethylene, aluminum foil, and nylon, a polyethylene terephthalate film (PET), a heavy duty aluminum foil, and a tissue paper containing 3.5% calcium carbonate buffer. The effect of no isolating layer was also examined. Whatman no. 1 cotton paper (W1) was chosen as the model archival paper to be rolled onto each of the 24 support cores. Magnets were used to hold the W1 paper and isolating layer in contact with the cores during artificial aging. Tubes were artificially aged at 90°C and 50% relative humidity (RH) for up to 24 weeks and sampled at various time points. Changes to the yellowness index (YI) and pH of the W1 paper were examined to understand how well the isolating layers succeeded as a barrier, preventing transfer of volatile elements from the core to the archival object. Preliminary results indicate at these aging conditions, heavy duty aluminum foil was the best isolating layer.

Maintaining Clarity: Developing a Methodology for Long-Term Studies of Conservation Adhesives and Processes for PMMA

Donald Sale, Conservation Guest Scholar, Getty Conservation Institute

This study establishes a framework for long-term investigations of conservation adhesives and processes for poly (methyl methacrylate) (PMMA) architectural models, furniture, paintings, photographs and sculpture. Samples of 20 year old adhesives on PMMA that were aged in different environments were investigated for molecular changes and visual acceptability for conservation repairs. Conservation treatments are presented alongside unresolved challenges to demonstrate the need to develop robust assessment methodologies, both to identify risks and to establish useful long-term investigations. Data from previous studies is compared to the initial findings in this study.

The Never-Ending Story of Conservation: New Technologies—New Challenges

Thea van Oosten and Anna Laganá, RCE (Cultural Heritage Agency of the Netherlands)

Contemporary works of art often pose particular practical and ethical concerns when they are made with techniques and materials others than those used traditionally by artists. Using objects in ways not intended may shorten their service life. Moreover, the use of new techniques since some years ago, such as 3D rapid prototyping, selective laser sintering (SLS) and fused deposit modelling (FDM), pose dilemmas to conservators and curators who have to decide whether damaged objects made with these techniques should be restored or remade.

Two case studies will be presented to illustrate these dilemmas and possible solutions. *Chandeliers*, an installation by the Dutch artist Madelene Berkhemer is one of the cases; the other is a vase by Marcel Wanders, a Dutch designer. Conservators should consider the role and context of an object being treated; in the case of contemporary works of art and design, this includes the artist's and designer's views on the object and how he or she intended it to look and to behave.

The artist Madeleine Berkhemer lives and works in Rotterdam. She creates erotically charged work. Her sculptures, drawings and performances are defined by the heterogeneity of their materials and styles. Her work is an investigation of the dimensions of time and space and a radical examination of social and economic conditions. The artist installations include nylon stockings tied around objects and the stress imparted in the stockings by this wrapping might accelerate the ageing of the work of art. Moreover, the environment in which the installation is displayed affects the life span of the object. To prolong the life of these works of art, a research project to investigate possible consolidation treatments has been set up at RCE, in

close collaboration with the artist herself.

Nowadays many polyamide (nylon) objects can be designed and created using 3D rapid prototyping. Jewelry, vases and other design objects made by these rapid prototyping techniques, such as the snotty vases of Marcel Wanders, are nowadays highly appreciated collectibles. Conservation treatments for 3D rapid prototyping nylon objects are unknown and, therefore, the cleaning and repair of the broken parts of a snotty vase by Marcel Wanders showed to be a challenge.

The question of whether it is more cost effective to invest time in researching the conservation of these objects or to have them remade or restored using 3D techniques is posed.

At RCE, investigations have been made to observe the behavior of some 3D rapid prototyped nylon objects under the influence of changes in light, %RH and temperature in order to set up guidelines for care and preventive conservation. Results will be presented at the conference.

Unilateral NMR and Multivariate Analysis: A Novel Non-Invasive Characterization Method for Artifacts Made of Modern Synthetic Resin Materials

Cindie Kehlet, Eleonora Del Federico, Hiba Shahbaz, and Amelia Catalano, Department of Mathematics and Science, Pratt Institute; Niels Chr. Nielsen, Interdisciplinary Nanoscience Center (iNANO), University of Aarhus, Denmark; and Jens Dittmer, Institut des Molecules et des Materiaux du Mans (IMMM), Universite du Maine, Le Mans, France

During the past decades conservators in museums have been increasingly challenged by objects made of modern synthetic resin materials. Such objects are vulnerable towards deterioration and degradation, which in part may be ascribed to their construction from commercial products not designed to last forever. The lifetime of modern synthetic resin materials varies and it is generally considered to be no longer than about 30 years, after which defects such as discoloration, stickiness, and cracking can be observed. A natural first step in the conservation of these objects is the identification of their composition and condition. The most widely used technique for these purposes is Fourier transform infrared spectroscopy (FTIR). IR methods generally require the removal of a sample or in the case of attenuated total reflectance (ATR), it only provides information about the composition on surface of the object, which may not be adequate when understanding the degradation underneath the surface is equally important.

Unilateral nuclear magnetic resonance (NMR) offers the possibility of non-invasive in situ analysis of a wide range of materials including modern synthetic resins. With the Profile NMR MOUSE[®], it is possible to obtain depth profiles of materials and thereby obtain information on the composition and molecular mobility at different depths from the surface of

the object. Transverse relaxation decay of protons in organic materials can be measured using the so-called Carr-Purcell-Meiboom-Gill (CPMG) NMR experiments where the time constant of the signal decay reflects molecular size and mobility. Such information is typically extracted by exponential fitting of the decay. The reliability of such procedures highly depends on the achievable signal-to-noise ratio and may be impractical when handling large datasets. Moreover, the decays are intrinsically multiexponential, and they must be approximated by a bi- or triexponential model function. Consequently, the results depend on the selected model function and are not always comparable. Here we demonstrate how multivariate data analysis of the relaxation decays can be used to provide a fast overview of large, potentially noisy, datasets with an unambiguous, model-free approach. One aim of the study is to explore the capability of principal component analysis (PCA) to discriminate data in terms of types of materials and molecular mobility. The method allows the analysis of large datasets obtained through mapping of large artifacts in all three dimensions to monitor structural changes and deterioration or obtained through the establishment of a reference database for conservation studies and analysis.

Contemporary Conservation for Contemporary Materials

Yvonne Shashoua, Senior Researcher, Department of Conservation, National Museum of Denmark

Conserving contemporary materials was first formally recognized as a discipline in 1991 marked by the conference “Saving the Twentieth Century,” organized by the Canadian Conservation Institute. Since mass production of plastics began in the 1940s, the global annual production has doubled every 15 years reaching 245 million tons in 2009. Plastics in new, recycled and upcycled forms have had a significant influence on industrial, domestic and cultural aspects of everyday life since the Second World War and therefore comprise an increasing proportion of museum collections.

Since the start of the 21st century, conservation research and practice for plastics have taken a preventive approach in which either the factors causing or accelerating degradation are removed in order to slow the major breakdown reactions. Gas adsorbents, also known as molecular traps or scavengers, are frequently used by museums to slow the rate of degradation of semi-synthetic plastics. Adsorbents are either installed in an active filter system in showcases and storage areas or simply placed in petri dishes or polyethylene bags inside storage boxes or enclosures.

Silica gel, activated carbon and zeolites are the most frequently used adsorbents in museum storage and display of all materials. They are introduced to create a microclimate by removing specific gases. Although widely employed to slow the degradation of semi-synthetic plastics, there has been little structured research into their effectiveness. Studies usually analyze the object before and after. However, it is difficult to detect

degradation in plastics until it reaches an advanced stage.

In a recent research project, gases adsorbed from new model and degraded cellulose acetate (CA) sheets dating from the 1950s to 1990s were identified and quantified. CA has been used since 1910 to produce spectacle frames, Lego bricks, Gabo sculptures and Disney cels. CA hydrolyses to form acetic acid which results in the autocatalytic breakdown of the plastic if it is not removed. After exposure, silica gel, activated carbon, zeolite 4A, Corrosion Intercept and an archival card were desorbed using GC-MS and evolved gas analysis which both identified the adsorbed gases and how strongly they were bound. Silica gel, activated carbon, zeolite and the archival card were found to non-selectively adsorb gases. In addition to water, silica gel adsorbed acetic acid and phthalate plasticizer from CA. Zeolite 4A is frequently used to slow the onset of autocatalysis of CA by removing acetic acid and water from enclosures. However, results from the current research suggested that zeolite 4A also adsorbed the plasticizer from the CA film, causing it to shrink. Activated carbon adsorbed both the plasticizer and flame inhibitor triphenylphosphate. It was ineffective to include adsorbents with new, undegraded CA films to inhibit the onset of degradation. In the absence of the degradation product acetic acid, the phthalate plasticizer was adsorbed resulting in shrinkage.

In conclusion, storing cellulose acetate in an archival card box may be more effective at adsorbing acetic acid than using adsorbents. The non-selectivity of many of the general adsorbents used in conservation is of concern and suggests that they may be ineffective or even accelerate degradation. Low temperature storage may be a more effective approach to preventive conservation of plastics than adsorbents.

Rapid, Minimally Invasive, Identification of Degraded Audio and Video Magnetic Tapes

Eric M. Breitung, Juan Rodriguez, and Samantha Skelton, Preservation Research and Testing Division; Peter Alyea, Preservation Reformating Division, Library of Congress; Briana M. Cassidy and Stephen L. Morgan, Department of Chemistry & Biochemistry, University of South Carolina

The Library of Congress (LC) holds more than 500,000 magnetic tape objects, many of which are degrading rapidly. As at many cultural heritage institutions and archives, a rapid method to identify degraded tape is needed to facilitate treatment prioritization before copying and/or digitizing. Even in ideal storage conditions, tapes degrade. Tapes produced during the 1970s to 1990s often contain polyester-urethane (PEU) binders that hold magnetic particles onto polyethylene terephthalate substrates. PEU binders are known to degrade via hydrolysis, which causes squealing and/or shedding of magnetic material onto playback device heads. This condition is referred to as “sticky shed syndrome” (SS). There are no known non-destructive methods for rapidly identifying degraded magnetic tapes. Several brands and models of tape are known to contain PEU binders and are

known to degrade, however tapes are rarely held in their original packaging or even kept on original hubs, making classification by visual inspection impossible. Playing a tape is the currently accepted method for classifying a tape as SS or non-SS. If the tape squeals, flakes, or gums playback equipment, it is classified as SS and removed from the digitization workflow for treatment. This process can not only render the playback device unusable, but it can permanently damage the tape and lead to loss of data.

Assessment of 100 LC ¼" audio collection tapes led to the development of a method for the rapid identification of degraded tapes prior to playback. Using Fourier transform infrared (FTIR) spectroscopy combined with multivariate statistics (MVS), the method's rate of accurately assessing tape condition was better than 98%.

This talk will focus on the application of the classification model produced from LC collection-based ¼" audiotape FTIR data to other formats such as U-matic, VHS, and ½" video. The ¼" dataset classification model was also applied to data collected from ¼" audio reference tapes of known provenance spanning multiple manufacturers and models. Establishing the applicability of the classification model to a broad and known set of tapes was completed to predict the usefulness of the model for collections outside of the LC and may allow for the identification of specific makes and models within a particular collection. In addition, direct analysis in real time mass spectrometry (DART-MS) was conducted on a set of degraded and non-degraded ¼" audio and ½" video tapes to investigate their chemical differences.

FTIR combined with statistical analysis is envisioned as a tool for rapid, on-site analysis of collection materials. However, attenuated total reflectance (ATR)-FTIR directly contacts the tape, and its use may affect the surface and possibly the sound or image fidelity. Modern ¼" audio tape was pre-recorded with standard test tones, subjected to ATR-FTIR testing, and played through an analog to digital recorder. The post-ATR-FTIR signals were compared to the pre-recorded signals at the same locations. The results of this testing will also be discussed.

Artful Science: Quirky Trends and Fascinating Discoveries in Cultural Heritage Research, from a Journalist's Perspective

Sarah Everts, Science Journalist, Chemical & Engineering News

Over the past decade or so, advances in analytical technology have led to an abundance of tools for cultural heritage research. This talk will survey some of the more curious (and fun) cultural heritage science trends, tools and developments from a journalist's perspective, such as studies of trace food left on ancient artifacts, the marriage between illuminated manuscripts and remote sensing, how spacesuits may lend a helping hand to modern art, and how conservation scientists are using eBay as a scientific resource.

The presentation will also tackle the miscommunication that

sometimes takes place between scientists and journalists, clarify why journalists purposely ask such seemingly daft questions, and propose some strategies for improving communication with the media.

Evaluation of Bridged Siloxanes as Organic-Inorganic Hybrid Consolidants for Qin Shihuang's Terracotta Army

Hongjie Luo, Professor, Shanghai University; Xiangna Han and Xiao Huang, Shanghai Institute of Ceramics, Chinese Academy of Sciences

Qin Shihuang's Terracotta Army is one of the most important and well-known cultural heritage sites in China. The army was probably set up to protect the nearby grave of the first emperor Qin Shihuang (259–210 BC) as well as his afterlife. At the renowned site, archaeologists began the latest round of excavation in 2009 in a pit untouched for two decades. The main damages of the unearthed ware sculptures are missing surface chips, cracking, and flaking, which are possible due to salt erosion and freeze-thaw.

The feasibility and effectiveness of two typical bridged siloxanes monomers as consolidants for the Qin Shihuang's Terracotta Army were investigated. The protection performances of selected siloxanes were tested on simulated terracotta samples in the laboratory by methods including colorimetric measurements, consolidant uptake, water absorption ratio, porosity and saturation factor in freeze-thaw. The treated samples exhibited a significant increase in resistance to freeze-thaw and salt damage, which could be attributed to water absorption reduction as the surface became hydrophobic. As expected, the dynamic elastic modulus and compress strength increased as the bridged siloxanes organic-inorganic hybrid formed. Meanwhile, the porosity decreased due to the pore filling by the hybrid consolidant, as revealed by mercury porosimetry. The water resistance ability was evaluated by the capillary water absorption test, and the "breath function" did not significantly change based on the water vapor transmission test data.

The Role of Polyester Film Encapsulation—With and Without Prior Deacidification—On Paper Degradation, Studied Using Long-Term, Low-Temperature Aging

William (Bill) Minter, Owner, William Minter Bookbinding and Conservation, Inc.; and John W. Baty, Assistant Research Professor and HSC Scientist, Department of Conservation and Preservation, the Sheridan Libraries and Museums

Polyester film encapsulation has become a very popular method for supporting and protecting fragile or deteriorated papers. Even new paper, such as maps that are heavily used in libraries and archives are often encapsulated. Previous research on the role of encapsulation on paper aging is limited, but suggests that

deacidification is necessary to slow the accelerated deterioration that encapsulated papers will otherwise undergo. Since it is very often not the case that papers are deacidified prior to encapsulation, this would suggest that many encapsulated papers in libraries, museums, and archives today are under threat of accelerated deterioration.

This study was conducted within the Heritage Science for Conservation project that is funded by The Andrew W. Mellon Foundation and located within the Sheridan Libraries and Museums—Department of Conservation and Preservation, Johns Hopkins University. Its purpose is to bring book and paper conservators, scientists, and engineers into the same working environment to research fundamental questions about materials degradation and conservation techniques; to expand the repertoire of scientific analyses to support conservation; and to develop information, products, and processes of demonstrated use at the conservator's bench.

In this study, four different text-weight papers from the mid-1900s, similar to those found in libraries and archives, were deacidified or left untreated, encapsulated, and aged at low temperatures (45°C or 60 °C) for up to 6 months. The aged samples were then analyzed for changes in pH and cellulose molecular weight using size-exclusion chromatography, as well as classical physical testing criteria. Aging conditions were selected to answer the most pressing questions regarding encapsulation, including (1) whether deacidification consistently makes a significant difference in the aging of encapsulated sheets, all else being equal—the “stewing in its own juices question”; (2) whether encapsulation makes a difference in the aging of acidic sheets—or of alkaline sheets—all else being equal; and (3) whether there is any significant difference in aqueous versus non-aqueous deacidification prior to encapsulation.

Fat Content in Collagen Based Adhesives— Assumptions and Investigation Results

Sofia Rydell, Assistant Furniture Conservator, Period Furniture Conservation

Collagen based adhesives with high fat content, such as rabbit skin glue, play a peripheral role within the field of furniture and wood conservation. The limited use of this category of adhesives primarily rests with the assumption that the percentage of fat is the determining factor in their low adhesive and cohesive qualities. Since there are very few published reports on this aspect of collagen based adhesives, the substantiality of these assumptions have to be verified.

This presentation will outline the practical implications of fat content in collagen based adhesives, based on Sophia Rydell's masters' thesis work “The Role of Fat Content in Gelatin Based Adhesives – An Investigation into how the Fat Content Affects Physical Properties,” published in 2011. Testing results indicated that an increase in fat content lowers the melting point and viscosity, characteristics which can be important in hot melt adhesives. More importantly, results also indicated that an increase in fat content improves the flexibility and strength of a wood joint.

Should the perception of high fat adhesives be revised?

While gelatin was the material used as the experimental model for collagen based adhesives, the work additionally highlighted the possibility of using this material as a wood adhesive. The circumstances when a high fat adhesive will offer an advantage over a lean adhesive will be brought to light, as well as its potential and limitations.

Finding the Ease: Approaches to Mounting and Installation at the Art Institute of Chicago

Isaac Facio, Conservation Assistant, Department of Textiles, and Lauren Chang, Conservator of Textiles, Art Institute of Chicago

Recent conservation in the Department of Textiles at the Art Institute of Chicago reflects the increasingly prevalent philosophy for those responsible for the wellbeing of historic collections of doing more with less. New buildings, gallery re-installations, construction projects, storage moves, exhibitions, loans, and multiple rotations have become routine in a year's projects for the permanent collection. Over the course of a year there are about 200 textiles in rotation throughout the museum—100 in the permanent textile galleries and another 100 in other galleries throughout the museum. At the same time the economic downturn resulted in an austerity plan, which included a 50% staff reduction in the Department of Textiles as well as the art handling staff.

The increased demand for textiles is both exciting and challenging. For the staff at the Art Institute it has reaffirmed the need to develop strategies to decrease stress and strain on the collection as well as the staff. It has also created the opportunity to rethink exhibition demands, considerations and priorities. In particular this paper will focus on the display of large African textiles, longer lengths of yardage, and tapestries.

The African textile collection contains a number of large artworks of varying dimensions. The size of each piece precludes storing individual mounts/platform for each rotation. A modular mount and platform was designed to accommodate a variety of needs and sizes of textiles ranging from 44 to 115" in height and 170 to 220" in width, eliminating mount production and reducing storage issues.

For extra long lengths of yardage, a "roll-top" system was redesigned to hold un-exhibited sections of the textile on the storage pipe suspended in a cradle above the mount. The system allows a textile to move from storage to the mount and back to storage, all on the same pipe, reducing handling. The cradle can accommodate multiple angles to adjust to the needs of the textile or display, while maintaining a smooth transition from pipe to mount.

A tapestry installation protocol was developed for *The Divine Art: Four Centuries of European Tapestry*, an exhibition of over 70 historic tapestries from the permanent collection. As at least 7 artworks needed to be installed per day, it was necessary to create an efficient and safe system that reduced staff fatigue. A newly designed hanging system incorporating a custom-built I-beam and receiving shelf was implemented. Existing hydraulic lifts with platforms were fitted with purpose-built arms to raise and lower the tapestries. The combination of all three elements allowed for a controlled, safe and smooth installation and de-installation of the artworks, while minimizing strain on the staff.

As textiles continue to gain popularity and prominence in

the museum, there will continue to be a need for innovation in installation. The strategies in this paper, which are works-in-progress, have transformed some of the more challenging installations at the Art Institute into more routine activities for both the conservation and installation staff.

An Old Case of New Display: Contemporary and Historical Fashion at the Victoria & Albert Museum

Joanne Hackett, Senior Textile Conservator, and Keira Miller, Dress and Textile Display Specialist, Victoria & Albert Museum

Over the past 10 years, over 70% of the Victoria & Albert Museum's public space has been transformed as part of an ambitious plan to turn the Museum into a 21st century cultural destination. As part of this process the fashion display, housed in Gallery 40, was renovated from January 2011 to May 2012. This one million pound refurbishment included new ambient lighting, new paint, new flooring and new display spaces, but no new cases. Alongside the renovation of the permanent display, housed within the same gallery, the V&A launched a temporary exhibition entitled *Ballgowns: 50 Years of British Glamour*, which showcases a collection of gowns made by Britain's most celebrated couturiers.

For these two projects, over 160 outfits were conserved and mounted for display. This paper will explore a number of challenges faced by the conservation and design teams to make a successful display in a less-than-ideal space. We will discuss the impact of having costume on semi-permanent open display including problems with touching, dust and light and how the design of the display can be manipulated to minimise potential damage. We will also look at the role of monitoring the environment and how this will affect the design of future displays planned for this space, including exhibitions of 1980's fashion and wedding dresses.

A Serigraph by Henri Matisse: A Case Where Painting and Textile Conservation Techniques Merge

Yadin Larochette, Conservation in Private Practice, Larochette Textile Conservation

In the summer of 1946, Henri Matisse (1869-1954) lay bedridden as he directed his assistant, Lydia Delectorskaya, to pin a series of white paper cut-outs he had made on to the walls of his Paris studio. The motifs, inspired by memories of French Polynesia, included starfish, algae, leaves, and birds. Two years later, upon being approached by Zika Ascher, a London-based textile printer known for his innovative techniques, he agreed to turn the wall designs into two large serigraphs, known as *Oceania, la mer* and *Oceania, le ciel*. Made with oil bound pigments for the cut-out

shapes, on dyed, un-primed linen representing the studio walls, each measures approximately 5.5' high and 12' wide.

This presentation will discuss the conservation treatment and preparation for display of one of the editions of the *Océanie, le ciel*. This particular serigraph had never been mounted before and was pristine save creases incurred in rolled storage. Unlike many of its counterparts, which had been stretched taught on strainers or stretchers in the same manner as paintings are traditionally displayed, sometimes apparently resulting in cracks and lifting of the pigment surface. Since stitching the body of the work to a support would have permanently altered the surface and been visually obtrusive, a system was developed to make the serigraph appear taught, while at the same time protecting the fabric edges and honoring the different surface characteristics of the paint and dyed linen. Working with a fine wood worker, a strainer with rounded edges was made to reduce distortions along the serigraph's perimeter as it wrapped to the back of the strainer. A cotton muslin support was brushed to produce a slight nap prior to being attached to the strainer, to help increase contact and "purchase" between the support and artwork. Once the artwork was pinned in place with even tension, the edges were hand-stitched to the back of the support, and the mounted serigraph was placed in an acrylic-covered frame. After two years of display in a private home, the system appears to have been successful, with no distortions or other effects evident due to environmental fluctuations.

Renewing the Past: Pressure Mounting Two Large Fragmented Flags

Jan Vuori, Senior Textile Conservator, and Renée Dancause, Textile Conservator, Canadian Conservation Institute

Two silk flags, the Colours of the 3rd York Militia Regiment from the War of 1812, were recently treated in the textile lab of the Canadian Conservation Institute. The King's Colour is a pieced Union Jack and the Regimental Colour has a plain field with attached silk fringe and silk embroidered motifs located in the two upper corners, centre and lower centre. Several challenges were posed by the powdering condition of the silk, the extreme degree of fragmentation and loss, the large size—each flag measures approximately 5' by 8'—and the materials and methods used in previous restorations. In 1927 both flags were stitched between coarse cotton netting. At some time in the 1970s the netted flags were mounted between Plexiglas and foam board. Unfortunately, double-sided carpet tape was used to attach the top edge of each flag to the foam board support. These two actions, i.e. sandwiching between net and pressure mounting, had served to preserve what remained of the flags. However, the materials used had become deteriorated, unsightly, and did not provide adequate support, consequently they were removed. The condition of the flags precluded other treatment options such as an adhesive lining or overlay stitched to a fabric covered support. Therefore netting and pressure mounting were repeated using

contemporary conservation grade materials and techniques. This paper will focus on the second step, pressure mounting, using one of the flags, the Regimental Colour, as an example. The mount consists of an aluminum honeycomb panel covered with cotton flannel, needle punched polyester, cotton display fabric and custom dyed cotton fabric to compensate for losses.

Pressure mounting is often described in the literature for stabilizing and mounting relatively small, fragile textiles or large textiles that are more or less in one piece. Unfortunately, these flags presented another situation, i.e. large, powdering, and extremely fragmented textiles. In order to develop a treatment protocol, information was gathered from several conservators experienced with the technique. In addition, practical tests were done to determine how the needle punched polyester batting would compress over time under the weight of the acrylic glazing. Trials, conducted during the demonstration of a commercial thin-film pressure mapping system confirmed that recesses cut in the batting to accommodate the thickest embroideries did indeed equalize the pressure from the glazing. Unfortunately, the sensors were not sensitive enough to measure the actual pressure. Other aspects that will be discussed include the glazing and frame. A UV filtering acrylic was selected due to its abrasion resistant, anti-reflection, and most importantly, anti-static properties. An aluminum framing system was designed in house. It consists of an inner frame which reduces bowing of the acrylic, and an outer frame which attaches the glazing to the panel. How the netted flag was transferred onto the correct position on the dyed compensation fabric attached to the mount will also be described.

Dancing on a Wire: Articulation Solutions for Mannequins in the Circle of Dance Exhibition at NMAI-NY

Shelly Uhler, Mount and Mannequin Maker, Cultural Resources Center, National Museum of the American Indian

This presentation will discuss the creation and fabrication of ten articulated custom mannequins for garments and associated objects in the "Circle of Dance" exhibition at the National Museum of the American Indian-New York. The exhibition, which opened in September 2012, showcases dances of ten tribes from different geographical locations in the Western Hemisphere. Each of the mannequins is articulated in a gesture specific to an important dance from each tribe, so creating the illusion of specific movement as well as providing distinctive facial features and hand gestures was imperative. A variety of arm and leg connection techniques were employed which utilized mechanical and magnetized attachments. The faces, hands and feet were created from Fosshape, a felt-like material that hardens somewhat when steamed. Topics discussed will be: Choosing poses for maximum illusion of motion; examples of arm, leg and knee connection techniques; and extension of the articulation to the expression of the faces and hands through the use of Fosshape.

New and Current Materials and Approaches for Localized Cleaning in Textile Conservation

Elizabeth Shaeffer, Graduate student, Winterthur/University of Delaware Program in Art Conservation; and Joy Gardiner, Winterthur Assistant Professor in Art Conservation and the Assistant Director of Conservation, Winterthur Museum, Garden & Library

This paper will explore current and developing approaches used in the cleaning of textile and costume objects. These emerging techniques employ poultices and gels to deliver specialized cleaning solutions locally to a textile's surface, enabling stains to be addressed individually. We will define these materials and discuss their working properties. The advantages and limitations of each will be evaluated, and potential applications will be suggested. We will also discuss how these application methods can be paired with carefully designed cleaning solutions that may include enzymes, chelators, or solvents, according to the nature of the stain. Recent case studies for xanthan gum, agarose gel, methylcellulose, and cellulose pulp will be presented, and we will indicate how each material is prepared and applied. Opportunities for future research will also be considered.

Ferrous Attraction: The Science Behind the Magic

Gwen Spicer, Conservator in Private Practice, Spicer Art Conservation, LLC

How to fasten or secure an artifact has long been a focus of art conservators in all specialties. We have stitched, glued and adhered items for decades. And with each method, the attempt was always to keep the conservation as reversible as possible. The somewhat recent development of strong, permanent, rare earth magnets has enabled them to be used as a reversible fastener. Neodymium rare earth magnets are far stronger than earlier permanent magnets and have only truly entered the market since 1990. They have great potential as a new tool for conservators. Could there really be a truly reversible tool that would not harm or create holes that we could use? Before these new magnets can be part of our future, a fuller understanding of how they work is needed. Moreover, a system needs to be developed to determine precisely which attributes a magnet should have for a specific project. What makes a magnet "permanent," when were they developed, and how magnets differ from one another (i.e. the various types and their unique materials and properties) will be demonstrated.

The use of magnets in the past has caused damage, slowing their use among some. However, with a full understanding of how a system is created and can be adapted, damage can be prevented. A "jig" with various combinations of magnets and metal components will be used by participants to demonstrate the actual system and its parts, different methods of implementation,

and the strength of commonly available magnets. This "hands on" experience can serve to stimulate conservators to better adapt a system to any specific artifact.

The material will be presented as a hands-on instructional format. Handouts will be provided.

Establishing Dye Analysis at the Conservation Science Lab of the Indianapolis Museum of Art

Victor J. Chen, Biochemist and Full Time Volunteer, Conservation Science Lab, Kathleen Kiefer, Senior Conservator of Textiles, Niloo Imami-Paydar, Curator of Textiles and Fashion Arts, and Gregory Dale Smith, the Otto N. Frenzel III Senior Conservation Scientist, Indianapolis Museum of Art

Knowledge of the chemical composition of the dyestuffs used on textiles can provide information on the history and origin of the textile as well as the technology employed to create it. This information may be valuable for conservation or curatorial purposes. While dyestuffs used on textiles can be of natural or of synthetic origin, the coloring matter involved in each case is generally one or more organic molecules. Confident identification of the dyestuffs on textiles often requires extraction of all of the colorants from the fiber samples, the resolution of the mixture into single chemical entities, and the subsequent individual identification based on chromatographic retention, light absorption characteristics, and molecular mass. In dye analysis, the separation of the colorants by liquid chromatography (LC) is combined with diode array detection (DAD) and mass spectrometry (MS) for structural characterization. Since the Conservation Science Lab at the Indianapolis Museum of Art began its operation in 2010, we have begun to employ LC-DAD-MS for dye analysis. In this presentation, we will share with you some details about the format of our experimental set up, some of the challenges we have encountered in sample extraction, the characterization of dye molecules, with and without relying on reference standards, and the issue of dye identity assignment. The data presented will include the characterization of certain reference dyestuff samples, such as madder, dyer's greenweed and Scotch broom, as well as the extracts of fibers from an Uzbek coat, in which we have identified such synthetic colorants as Fast Red AV and Acid Green 16, along with natural alkaloids berberine and palmatine that have been reported to be present in Berberis, Coptis, or other plant species.

Emergence of "Antique" Synthetic Textiles

Ebenezer Kotei, Objects Conservator, Hagley Museum and Library

After the Du Pont Company came out with nylon and gave birth to the synthetic polymer fiber industry the world was presented with an alternative raw material for clothes-making that did not

involve the use of natural fibers or come from natural sources. Little did the world know about the intense research that went on behind the scenes, and the resultant accumulation of artifacts that document the road to that giant step. Hagley Museum and Library in Wilmington, Delaware, is the depository for the autoclave in which Wallace Carothers invented nylon, his research notebooks and the myriad of sample fibers, the first spools of fibers to roll off the mills, the first nylon shirt ever made, women's slip made out of parachute grade nylon, pre-production wear-tested dresses and more. The collection tells the story of how to produce brightly-colored fabrics out of "plastic" fibers that would not accept the dyes of the era, struggling to spin the new fiber on mills that were designed for spinning wool and cotton, and how to romanticize "wrapping ourselves in plastic" as it were.

Synthetic fibers posed a strong challenge to the reign of King Cotton yet the king held its own. But synthetic fibers fought back and proved to be just as supple, attractive and comfortable as silk; hail the arrival of Qiana nylon. Since that first discovery, several new and contemporary crude oil based textile materials have revolutionized the textile industry.

Now, these unlikely collectors' textiles are rapidly filling museum storages the world over. They are being collected because they were worn by movie stars and pop stars, famous leaders and princesses, or were designed by some of the world's renowned fashion designers. To most of us conservators, antique clothing means clothing made of natural fibers. So where do synthetic clothing fall in the complex admixture of textiles worth preserving? What are the conservation issues regarding synthetic fibers?

Some clues to their preservation may lie in their manufacturing processes. Knowledge of the nature of, and the timeline for the emergence of important synthetic clothing items such as Lycra, Orlon, Dacron, Qiana, Nomex, will help to assess their condition. It will be good to examine the methods and techniques of the original inventors of these materials. The collection at Hagley can help shed some light on these issues.

A "Green" Solvent for Textile Conservation?: Examining the Potential of Cyclosiloxane D5 as an Alternative Cleaning Solvent

Julie Benner, Assistant Costume Conservator, Chicago History Museum; Frances Lennard, Senior Lecturer, and Dr. Anita Quye, Lecturer in Conservation Science, University of Glasgow Centre for Textile Conservation and Technical Art History

Concerns about the health and environmental impacts of some solvents used in textile conservation have signaled the need for more environmentally friendly alternatives. At the same time, "green" cleaning solvents have begun to be developed by the professional dry cleaning industry. One of these alternative solvents, a cyclic silicon-based liquid, decamethylcyclopentasiloxane (D5), may have potential for use in textile conservation, however there previously have been no studies to show how its use may impact textile artifacts.

In this study, the "green" profile of D5 was reviewed, along with a look at its structure, properties and potential for solubility. A series of experiments was performed to test the effects of D5 on textiles and to examine its soil removal performance. The samples used in testing were soiled and unsoiled new cotton and wool fabrics, some of which were artificially aged. Analysis of the effect of D5 on textile substrates employed Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy, tensile strength tests, and scanning electron microscopy (SEM). Soil removal tests were analyzed using colorimetry and ATR-FTIR. In the results of the analysis, no appreciable difference in the condition and composition of treated and untreated samples could be detected. D5 was shown to have significant effect on nonpolar soiling. Assessment of the overall results suggests that there is potential for use of D5 within the textile conservation field, however limitations of the trials indicate a need for more research.

21st Century Art, Design & Conservation: Protected Materials and Fine Arts Conservation

Yuri Yanchyshyn, Principal and Senior Conservator, Period Furniture Conservation, LLC; and Alexandra Darraby, Principal, The Art Law Firm

Recent press reports seem to indicate a sharp uptick in the illegal trade of materials derived from endangered species, including ivory, tortoiseshell, tropical woods and exotic feathers. The drought in the American southwest has exposed Native American artifacts to predations of looters. And, in perhaps the most famous case of all, Robert Rauschenberg's *Canyon*, which incorporates a stuffed bald eagle (a specimen acquired before it was illegal), is caught in a legal limbo. The IRS insists that the item is worth \$65 million—and wants proportionate tax and penalty—while auction house Christie's values the item at \$0, citing the inclusion of the now illicit eagle.

The implications of now-protected materials incorporated into fine arts objects are far-ranging. They include legal, financial and ethical issues.

This presentation will give a legal and materials overview of these complex situations and how they may affect fine arts conservators in both institutional settings and private practice. The first half of the presentation will outline the various laws and international conventions that apply to protected materials, and will elucidate the multifaceted legal and ethical obligations of conservators when working with them. The second half of the presentation will examine materials that were used for centuries in the creation of furniture objects, but are now protected. We will provide pointers for identifying these materials, historical context of their use and options available to conservators when the integrity of the object intersects with the realities of procuring replacement materials.

Contemporary Sculpture: To Contact the Artist or Not?

Rose Cull, Conservator, Art Conservation Services, LLC

This presentation will explore the challenges involved in the treatment of two contemporary wood sculptures, *End of Day, Nightscape IV*, 1973, by Louise Nevelson and *Mass (Colder Darker Matter)*, 1997, by Cornelia Parker. Both sculptures consist of found wood objects and non-traditional art materials, both treatments involved cleaning, but in one case the artist's foundation was contacted and in another case the artist was not contacted.

Both sculptures contain found wood objects from different sources. Nevelson used wood from printing trays and other post-industrial debris, while Parker used charred wood from a building burnt down by a lightning strike. Both artists used contemporary materials, Nevelson painted these found objects with matte black spray paint, Parker installed her work on nylon

or monofilament threads. These sculptures were created 24 years apart and the artist Cornelia Parker offered the museum crates of additional pieces of charred wood to replace losses. Parker showed an awareness of the inherent vice in the material she used in the sculpture and she understood that the sculpture would need to be loaned, installed, and de-installed. She gave specific instructions for these tasks and anticipated the potential for damages during the artifact's museum life.

The treatment for both sculptures involved removing dust from the surface, because of the fragile surfaces the dust removal was performed by manipulating the surface as little as possible. The aesthetic value of the sculptures was improved after cleaning, distracting amounts of dust were removed and the black wood appeared darker. The Nevelson treatment also involved stabilization of the paint, minor repairs of wood elements, and in-painting losses.

Interviewing an artist is an important tool for a contemporary art conservator. It allows the conservator to better understand the intent of the artist's work and it can provide insight into the materials and techniques involved in the creation of the work. But it is important to understand when an artist interview is necessary, and the difference between a consultation with the artist, asking one or two specific questions, and a full artist interview. The two cases studies will illustrate the appropriate use of this tool. For the treatment of the Nevelson sculpture the Louise Nevelson foundation was contacted, by comparison the artist Cornelia Parker was not contacted as part of the preparations for the treatment of her sculpture.

The paper will touch on legal issues involved around the decision about whether to contact an artist, as illustrated by the Visual Artist's Rights Act (VARA). The act defines the deterioration and conservation of a work of art and these definitions can be interpreted to understand the choices a conservator is faced with when treating a work of art. The paper will consider if there is a point when the training of a conservator allows them to make decisions about the treatment of a work of art, especially if the artist is unwilling or unable to perform these treatments.

Schooner Virginia: Addressing Inherent Issues in Ship Restoration

Nicole Wittig, Masters Candidate, Program for Maritime Studies, East Carolina University

Historic ship preservation presents dilemmas for long-term management plans. Beyond practical concerns, money and other resources, a ship does not always remain in its original form. Ships can, and often, undergo major modifications throughout the course of a vessel's lifespan. Those modifications are sometimes related solely to routine maintenance and repairs; but occasionally, vessel modification repurposes a ship for new tasks or modernizes an older vessel. Repurposed or renovated ships that transition from working vessels to museum objects challenge the accepted principles of ship preservation and/

or restoration. To demonstrate, a mid-19th century schooner, *Virginia*, will illuminate preservation and restoration concerns facing museum administration.

Constructed in Mobile Bay 1865, *Virginia* fished and sailed the Gulf of Mexico's waters for nearly 125 years. During its expansive career, the 55 foot schooner underwent multiple alterations to update the ship's form and propulsion; allowing it to continue functioning in a developing commercial fishing fleet. Originally a two-masted, sail powered vessel, the 1914 owner installed a diesel engine. This represents an early 20th century trend for sailing vessels switching to auxiliary engines. In the late 1930s, owners removed both masts and an engine supplied the sole source of propulsion. After 1989, the final owner maintained the vessel until sold to the National Civil War Naval Museum. Since 2000, *Virginia* has remained stored at the Georgia-based museum awaiting final restoration decisions.

How then to proceed with restoration? Typically historic significance determines whether a ship warrants preservation, a lengthy and expensive process. *Virginia* serves to demonstrate the longevity of wooden shipbuilding and also several distinguishable trends in American maritime history. The question becomes how to justify saving one historic form of the vessel over another. Age, rarity, and rumored connections to Civil War smuggling, favor the eighteenth century centerboard schooner form. However, the early 20th century auxiliary vessel included in the Historic American Merchant Marine Survey, of which only one other survey vessel remains, points to this era's significance. Yet, the final phase of a diesel powered commercial fishing vessel deserves consideration because, according to a Coast Guard survey, *Virginia* operated as the oldest fishing vessel in America's fleet until 1989. Discussion of *Virginia's* potential restoration reveals fundamental questions regarding object significance and consideration of forms and elements to preserve which best represent an object with a complex history.

The Gordian Table Circa 2011

Rick Parker, Parker Conservation Inc.

In 2010, after nearly 20 years of contemplation, the restoration of a fully 3-dimensional replica of the Gordian Table found in Tumulus MM at the Gordian site in Turkey began. This project from the start was without funding or grant sourcing and was a labor of love to replicate as closely as possible the very elegant and intricate yet surprisingly simple table. The lecture focuses on what it took to make full scale computer generated drawings of each piece and transfer that to wood harvested from New Zealand that was in itself 40,000 to 60,000 years old.

The complexity of the original was re-created by using tomb photos of the pieces in situ during the 1950's tomb opening. Many questions were answered; many more were opened up because of the technology and craftsmanship of the original object. While there are many three legged tables from this period in the Middle East (500-900 B.C.), nothing like this table and

the several other objects clearly made by the same craftsman or school of craftsmen and only found in the one tomb, have truly been fully identified and attributed to a specific site and/or time. The original craftsman clearly had phenomenal skills and was very proficient with his craft well beyond what should have been the standard at that time in history. Replicating the process from beginning to end proved challenging and yet rewarding to discover not only the success but the little failures along the way that most surely were felt while building the original. Clearly the tools available during the time period as far as we are currently aware proved wholly inadequate for this table. Modern era tools proved to be almost as inadequate as well. Many of the tools necessary had to be fabricated to establish the same type of tool marks found on the original. Every attempt was made to truly make this table appear as a used piece of furniture without making it an attempted forgery of a piece. Furniture conservators have struggled for decades with making their work invisible but identifiable and that is true with this project. There is probably nothing truly square or perfect about this table but it imparts the charm we all have found with the aged objects we deal with on a daily basis including repairs made early on in the table's history. Seasonal wood movement was allowed to explore its own path also adding that element to the finished table.

Finish for the table was derived from harvested resin from the 40,000+ year old Kauri wood. It was prepared in a manner consistent with technology available to the original craftsman and produced a surprisingly lustrous and reflective coating. No analysis has been done to date on the original coatings so the finish is at best a good guess.

The table project represents what many conservators and historians have talked about for years, building something with the skills and experience senior conservators have acquired as a result of spending considerable time with the objects entrusted to us. The lecture will highlight the process for one such project.

Flight of Memory: The Conservation of a Temporary Structure for the 9/11 Memorial Museum

John Childs, Senior Conservator/Historic Preservation Specialist, Art Preservation Services, Inc.

As the rate of change in the physical surroundings of American society continues to accelerate, and we race to create or own the next "New Thing," the nature of the meaning of individual objects is changing. In essence, all objects are becoming ephemeral. We may value a design, but less the object that embodies that design. Instead, significance and emotional weight is often transferred to objects through their symbolic association with more abstract ideas of meaning and importance. For the conservator, this means that our efforts at preservation are more and more frequently directed at artifacts never intended to last for long, and whose importance as objects lies less in their

physicality than in the symbolic meaning they represent.

After the attacks of September 11, 2001, during the recovery at Ground Zero in New York City, a special platform was constructed to allow family members of the victims to view the recovery efforts in a private setting away from the general public. The structure was intended to be temporary, and was built out of pressure treated lumber. Family members used the structure as a canvas to write memorial messages, transforming the platform into a spontaneous artifact of memory and meaning. As the World Trade Center Site translated from a recovery effort into a construction site, the platform and stairs were removed and the component elements were saved and stored by the Port Authority of New York and New Jersey.

Ownership of the platform components was eventually transferred by the PANYNJ to the 9/11 Memorial Museum, which incorporated the stairs to the viewing platform into its exhibition design. When I started working on the project in the summer of 2011, the stairs were partially dismantled and stored in a climate-modified tent within the PANYNJ's 9/11-related storage facility, Hangar 17 at JFK Airport. As an object, the flight of stairs was very different from furniture normally encountered in museum settings. Its meaning resided not in its form or the artistry of its construction and decoration, but rather in its power to evoke and represent the poignancy of its original purpose. The inscriptions, written in everything from stable graphite and chalk to highly fugitive felt-tip inks, served to endow the entire structure with meaning.

Treatment of the stairs involved replacement of the original nails with stainless steel removable fasteners, insertion of some small new structural elements to replace missing elements that were part of the larger platform, the creation of 3D computer drawings of the stairs for the design team, and the digital photography documentation of all inscriptions on all surfaces of the stairs. All of these treatment efforts had to have as their primary

goal the preservation of the fleeting inscriptions, left by people suffering profound loss, recording their thoughts, prayers, hopes and memories on this once temporary, but now transformed, piece of assembled lumber.

We Can Fix It But Should We? Take 2: Contemporary Art Comes Knocking

Tad D. Fallon, Principal, Fallon & Wilkinson, LLC

A local private collector approached the Studio of Fallon & Wilkinson LLC to consult on the treatment of a contemporary piece made by California-based studio furniture maker and wood sculptor John Cederquist (born August 7, 1946).

The piece, a "Kosode" form two-door cabinet, had sustained severe UV damage with significant fading of the originally colorfully dyed surface design elements. The surface decoration included a Mickey Mouse Arm using a traditional wood plane, inlaid wood shavings falling from the tool, checkerboard "parquetry," geometric clan signs, and Japanese writing. The inside of the cabinet was protected from the UV exposure and subsequently retained the wonderful rich color and surface characteristics that had disappeared from the front of the cabinet.

The client's request was to conserve and restore the vibrant dye and ink colors and surface topcoat to the now faded areas, particularly on the large front of the cabinet, which is shaped like a life-sized kimono.

As conservators, occasionally we are asked to undertake treatments that ultimately may have complex professional, ethical and market valuation considerations, and these issues become a large part of the equation when dealing with Contemporary Art.

This paper will explore these issues, and the journey it takes to find the answers.

JOINT SESSIONS: PAINTINGS + RESEARCH & TECHNICAL STUDIES

Development of Artificial Aging Parameters of Modern Acrylic Paints to Better Mimic Long-Term Outdoor Urban Exposure

Amanda J. Norbutus, Postdoctoral Scholar in Chemistry, Villanova University

Works of art kept in outdoor environments, particularly objects and mural paintings, are vulnerable to deterioration through photodegradation, oxidation, and mechanical abrasion, no matter how well they are treated or maintained. Analysis of art materials using analytical techniques, such as LC-MS, FTIR, terahertz spectroscopy, and SEM-EDX, can help provide an improved understanding of the composition of modern artists' acrylic paints. However, when trying to determine the aging characteristics of outdoor painted artworks, there is difficulty in determining which artificial (accelerated) aging method best corresponds to the real-time outdoor exposure conditions.

Correlation between artificial aging and long-term outdoor urban exposure often lacks fidelity, as photocatalytic reactions are exacerbated in the aging chamber, particularly photooxidation. However, reactions under unpredictable conditions (e.g. weather: freeze/thaw cycling, relative humidity, snow, ice, rain) are not easily mimicked using weatherometers (QUV) or light aging chambers (Atlas xenon arc). The implied advantages of artificial aging in material studies are that the extreme rate of aging and quicker failure can help scientists predict long-term stability and durability of art materials within a reasonable amount of time. Yet a question remains as to how do hours of exposure in an aging chamber match the hours of natural exposure. For example, Philadelphia has an annual average of 62% possible sunshine. Therefore, on a day with 8 possible hours of sunshine, a cultural heritage object might receive only 5 hours of sunlight exposure. How do those 5 hours correlate to 5 hours in the light chamber? Previous research involved artificially and naturally aged UV-protective coatings on artist's acrylic paints; however, the data collected from the chemical, mechanical, and thermal assessment of these aged samples did not always correspond, as expected. A more recent project involving prepared samples of artists' acrylic paints may provide a better correlation of artificial aging to natural aging in a Mid-Atlantic environment and help develop modern protocols for replicating natural outdoor exposure in laboratory-based experiments.

In this study, acrylic paint films were naturally and artificially aged and both sample sets were periodically analyzed to determine the different stages of change and deterioration in the surfactant, paint binder, and commonly-used outdoor pigments, and to examine the relationship between the two aging protocols. Environmental conditions (intensity of solar illumination, rainfall, temperature, % RH) were recorded using National Weather Service data. The average environmental conditions were replicated as closely as possible in the weatherometer during artificial aging. It is hoped that this paper can offer improved guidelines

for future conservation research projects involving the use of artificial aging of contemporary art materials.

Gessoes: Porosity and the Effects of Capillary Action

Michael Doure, Ashley Freeman, H.F. Shurvell, Alison Murray, Art Conservation Program, Queen's University; and Laura Fuster-López, Instituto Universitario de Restauracion del Patrimonio, Universidad Politecnica de Valencia

Gessoes are a wide class of materials used in the surface preparation of art works. Traditionally the term refers to a white pigment, such as calcium carbonate or calcium sulfate, bound with an adhesive, such as hide glue. For modern artworks, however, the definition has expanded to include many materials that are compositionally very different but designed for the same purpose; that is, to prepare the surface for further work such as painting or gilding. In the field of paintings, gessoes are widely used, both by artists to prepare the support structure of the works and by conservators who commonly use gessoes to fill losses in the pictorial layer.

By their nature, gessoes facilitate the diffusion of fluids by capillary action. The diffusion characteristics of a material can affect many properties, including longevity, removal, and handling. More specifically in the conservation field, liquid diffusion can also cause components found within layers to migrate, which may result in the disruption of the pictorial layer. Such properties may also influence specific treatments, such as inpainting, in this way affecting the final appearance of the work of art.

This paper reports the measurement of the rate of diffusion of common cleaning solvents and inpainting media by attenuated total reflection - Fourier transform infrared spectroscopy (ATR-FTIR) for a variety of commercially and lab-prepared gessoes. This includes materials based upon acrylic polymer emulsions, as well as those based on a traditional hide glue binder.

Water in Oil Microemulsions: A Novel Cleaning System for Acrylic Paints

Melinda Keefe and Christopher Tucker, the DOW Chemical Company; Bronwyn Ormsby, Nelly von Aderkas, and Catherine McKenny, Tate; Alan Phenix, Scientist, and Tom Learner, Senior Scientist, Getty Conservation Institute

This presentation will offer an update on the continuing collaborative research project between The Dow Chemical Company, the Getty Conservation Institute and Tate, which aims towards development and evaluation of novel systems for the cleaning of acrylic paints. Early findings from this project were presented at AIC Los Angeles 2009 and AIC Milwaukee 2010.

One class of potentially useful formulations that was

identified in the early phase of the project was (water-in-oil) microemulsions; these are thermodynamically stable preparations consisting typically of water, non-miscible (hydrocarbon) solvent, co-solvent and surfactant. Such preparations offered the possibility of exploiting the cleaning efficacy associated with aqueous systems but in a predominantly solvent environment. A series of trial microemulsion cleaning formulations prepared by Dow have been evaluated by Tate and conservators at a series of training workshops focused on the practice of cleaning acrylic painted surfaces, and those evaluations have contributed to further refinement of the formulations for better compliance with the performance criteria desired by conservators.

The presentation will report the progress of this ongoing research collaboration focusing in particular on the development of the microemulsion systems. Three classes of microemulsions have been developed to offer a range in cleaning power and formulation latitude. All three systems contain an aliphatic hydrocarbon continuous phase. The systems differ in the type of surfactant and presence/level of an alcohol co-solvent. The co-solvent is required with some systems to enable a stable microemulsion structure. Phase diagrams for these preparations will be presented which demonstrate the range of proportions of the respective ingredients at which stable microemulsion systems are maintained; these include preparations that are (hydrocarbon) solvent-rich and low in surfactant and water content. Observations will also be presented on the comparative performance of these cleaning systems from the point of view of the practicing conservator, including their application to a wider range of substrates.

Mass Spectrometric Imaging of Acrylic Emulsion Paint Films: Engineering a Microemulsion-Based Cleaning Approach

Anthony F. Lagalante, Associate Professor of Chemistry, Villanova University; Richard C. Wolbers, Associate Professor of Art Conservation, Winterthur-University of Delaware Program in Art Conservation (WUDPAC); and Amanda J. Norbutus, Postdoctoral Scholar in Chemistry, Villanova University

Water-borne emulsion polymer paints have enabled artists to move aesthetically far from traditional limitations of oil paints, but have left us with a cultural legacy replete with some of the greatest challenges in terms of conserving and exhibiting these treasures. Methods for treating and exhibiting traditional oil paintings have been developed over the last five centuries and their suggested display and storage parameters have principally influenced the design of the modern museum environment. The exact parameters for acrylic paintings, particularly those of cleaning methodology, are not as well understood. To better define acrylic cleaning considerations, we have examined pH, conductivity, and specific ion effects of potential aqueous cleaning solutions on a series of commercial acrylic paints in order to minimize the extraction of paint film components and

minimize physical distortion of the paint film. 3-D microscopic techniques were developed to characterize the physical changes (volume and surface roughness) and liquid chromatography-tandem mass spectrometry was used to characterize the extent of extracted surface surfactant (Triton X-305) following paint film exposure to the cleaning solution. The tested paint films in this study exhibited an isotonic point below which swelling and extraction is significant, and above which the swelling and extraction is diminished. Experimentally, optimization of conductivity and the ionic species in solution reduced both the physical film changes and surfactant extraction from acrylic paint films; in contrast, pH appears to be of limited use in controlling aqueous cleaning effects. Additionally, there seems to be a specific ion effect for both swelling and de-swelling in acrylic paint films that can be rationalized through the Hofmeister Series.

Recent work funded through the National Science Foundation has focused on the formulation of microemulsions incorporating the optimized aqueous cleaning solution conditions to minimize aqueous solution contact with the paint film surface that included conservator-testing of optimized microemulsion cleaning solutions at the Cleaning Acrylic Painting Surfaces (CAPS 2012) workshop. 2D-desorption electrospray mass spectrometry (2D DESI-MS) is being explored for the first time for the chemical analysis and chemical imaging of art surfaces. DESI-MS and enhanced modes of the linear ion trap mass analyzer can chemically map surfactant on the paint surface before and after microemulsion cleaning and surfactant oxidation products during aging studies. 2D DESI is being investigated as a complementary technique to electron spin resonance (ESR) imaging to image free radicals and ESR silent photoproducts. Studies that investigate the environmental storage conditions (relative humidity, temperature, vibration) on the migration of surfactant to the paint film surface will also be discussed. The introduction of 2D DESI offers a new molecular imaging technique to the museum conservation laboratory and will likely find utility in projects outside the scope of the present work. This paper will discuss the findings of this study and suggest new guidelines for the cleaning of acrylic paintings in museums.

Traditional Artist Materials in Early Paintings by Andy Warhol

Suzanne Q. Lomax, Organic Chemist, Scientific Research Department, Christopher A. Maines, Conservation Scientist, and Jay Krueger, Senior Conservator of Modern Paintings, National Gallery of Art

Andy Warhol, an important figure in the pop art movement, was at the leading edge of the newest and most forward directed artistic expression of his time. Recent scientific examinations of several of Warhol's paintings from the 1960s, including *A Boy for Meg* (1962), demonstrate that his materials were not necessarily as modern as the style and substance of his works. Although Warhol's work throughout the '60s, '70s, and '80s

pushed increasingly towards removing the artist's hand from the work and frequently employed silk-screen techniques to achieve this, in the pivotal year of 1962 he obviously preferred brush painting using traditional media for his first large scale paintings on canvas. Binding medium analysis using gas chromatography – mass spectrometry has shown that the presence of egg proteins mixed with drying oils as the primary painting medium and not the casein that has been commonly associated with these important transitional paintings. Commercial egg tempera paints were readily available in tubes, and he would have been conversant with these matte, fast drying paints from his decade long career as a commercial illustrator. By the following year, he does move to screen printing with acrylic paints and inks. This talk will cover technical and scientific analyses of paintings from the National Gallery of Art, the Museum für Moderne Kunst, Frankfurt, the Museum Ludwig, Cologne, and the Warhol Foundation, Pittsburgh, and will discuss the extent and implications of these findings in better understanding Warhol's early methods and materials.

Rediscovering Color: Treatment, Analysis and Digital Restoration of Vincent Van Gogh's *Undergrowth with Two Figures*

Jeffrey E. Fieberg, Associate Professor of Chemistry, Centre College; Per Knutås, Chief Conservator, Cleveland Museum of Art; and Gregory Dale Smith, Ph.D., Otto N. Frenzel III Senior Conservation Scientist, Indianapolis Museum of Art

One of the most revered paintings in the Cincinnati Art Museum, Vincent van Gogh's *Undergrowth with two figures/Sous bois*, painted in the last month of his life in 1890, was requested for loan in 2011. Found to be structurally sound upon examination, the painting's visual appearance was nevertheless compromised as a result of a wax lining administered in 1975. Treatment was proposed to remove a significant amount of wax and an inappropriate varnish layer. Given the painting's popularity with visitors, Chief Conservator Per Knutås proposed to treat the painting while on view. Pre-treatment research, later confirmed during treatment, indicated the composition once included pink flowers, now effectively faded; possibly the fugitive geranium lake favored by Van Gogh. This question prompted the Cincinnati Museum of Art to propose a collaborative investigation with the Conservation Science Department at the Indianapolis Museum of Art in order to digitally reconstruct the painting to a state more truthful to its original conception.

Color and Spectral Archiving Using a Dual- RGB Imaging System

Jim Coddington, Agnes Gund Chief Conservator, Museum of Modern Art; and Roy S. Berns, Richard S. Hunter Professor in Color Science, Appearance, and Technology, Center for Imaging Science, Rochester Institute of Technology

Digital technologies present conservators with numerous new tools on many fronts including core activities like documentation. Often, though, the cost and complexity of the new technology is a barrier to its full implementation by the field. This paper will present the development and refinement of a multi-spectral imaging system (Dual-RGB) that uses off-the-shelf hardware and simple custom software, thereby reducing cost and complexity, to demonstrably improve the color accuracy for conservation documentation through a spectral estimation technique.

This system consists of a standard digital camera of reasonably high spatial resolution, two custom filters and standard studio lights for capture of the images. The camera has the IR filter removed to extend sensitivity. Processing of the images is done with a GUI-based program generated in Matlab and executable on any OS.

Fundamentally the system increases the number of channels captured from the standard 3 RGB channels to 6 by placing the two filters in the optical path and capturing images with each filter, hence the name Dual-RGB. First a white board is imaged with the filters so that the object images can be flat fielded to remove lighting artifacts and further improve the spectral estimation. A target such as a ColorChecker Classic with known spectral measurements is then imaged by the system to calculate a transformation matrix. This matrix will then be used to derive the spectral estimation of the object being imaged, which is also imaged with the two filters. Finally the object is captured with the two filters after which the image processing steps are done. The calibration images of white board and known target can be used for processing multiple objects provided the camera and lighting set up does not change.

Four computational steps are required for the Dual-RGB approach: flat fielding, image registration, colorimetric processing, and spectral processing. Flat fielding includes spatial low-pass filtering, effectively removing noise artifacts from the sensor and smoothing any texture or dirt of the diffuse white board. The image registration is calculated at the sub-pixel level. The archived image is a nine-channel ProPhotoRGB Tiff file. The first three channels are ProPhotoRGB encoded data. Channels 4-6 are image data from filter 1 and channels 7-9 are image data from filter 2. Channel 4-9 data have been flat fielded, registered, rescaled and encoded nonlinearly using the sRGB standard, and quantized to 16 bits.

The colorimetric and spectral processing achieves high color accuracy, reasonable spectral accuracy, and minimal noise propagation. The average DeltaE2000 for a color chart is less than 1

versus a range of 1.3 to 5.8 using the standard capture for a range of medium format digital camera backs. Perhaps more importantly the maximum error of the Dual-RGB system is 8.3 versus a range of 15 to 32 with the standard capture.

Total Appearance Image Archiving and Rendering using Studio Lighting

Roy S. Berns, Richard S. Hunter Professor in Color Science, *Appearance and Technology*, Center for Imaging Science, Rochester Institute of Technology; Tongbo Chen, Laboratory Engineer, Interactive Media Group and Apple Inc; and Jim Coddington, Agnes Gund Chief Conservator, Museum of Modern Art

Imaging artwork for documentation and reproduction has a long and rich history, resulting in images with both high resolution and quality for a specific viewing experience. When multiple experiences are desired, e.g., normal viewing and raking, separate images are captured.

Alternatively, computer graphics (CG) can be used to create a virtual experience where lighting and viewing are changed interactively, enabling multiple experiences from a single dataset, obtained by capturing multiple images using dozens of lighting directions, e.g., a dome or portable flash. The focus of such research is on the interactive experience as well as forensics where details might be obscured using conventional imaging.

Beginning in 2006 research was initiated to merge these two approaches, that is, to measure the physical properties of the artwork with high resolution and quality such that CG could be used to both interact with the object and render multiple experiences at high resolution and quality without re-shooting. A concomitant goal was for the image capture to be readily implemented in a museum imaging studio using existing equipment.

For paintings and drawings (assumed to be planar), the minimum physical properties for CG are color, surface macrostructure (depth or surface normal), and surface microstructure (gloss), all a function of xy position, that is, the artwork's total appearance. If we further assume that the object's gloss is consistent (e.g., varnished painting or matte drawing), a studio setup can be used to measure color and surface normal and the gloss defined by the user, either visually or from an artist material database.

Two digital cameras have been tested: a Canon Mark II with 85mm lens and a Sinar 86H rePro system with Sinaron 100mm lens, each affixed with a glass linear polarizer. Four Broncolor Pulso G 1600 J strobes with P70 reflectors, barn doors, and affixed triacetate film linear polarizers were used as light sources with each light positioned symmetrically 90° apart within an annulus and 45° from the object plane. Thus conventional 45° illumination from two strobes is augmented by two additional strobes, one above and one below. Calibration requires imaging a glossy black ball to define lighting geometries, setting cross polarization, imaging a diffuse white board, and imaging a color target. Automated software outputs sRGB encoded diffuse color

and surface normal floating-point images (PFM). For artwork, 6 images are collected: each cross-polarized strobe (4) and the left and right strobe with parallel polarization (2).

Software was written, "Artviewer," to render images interactively for specific lighting conditions, either a point source or museum lighting. Once a view is defined, full-resolution 16-bit Tiff files can be created. "Isee" was also written to view the floating-point images, similar to HDR Shop.

The system has been tested in the conservation studio at the Museum of Modern Art for paintings of Pollack, Van Gogh, and Magritte. One of the advantages of this system is that it can be readily implemented in a museum imaging studio, providing both conventional high-resolution images (via parallel polarization) and total-appearance image data.

Reuniting Poussin's Bacchanals Painted for Cardinal Richelieu through Quantitative Canvas Weave Analysis

Robert Erdmann, Assistant Professor, Materials Science and Engineering and Program in Applied Mathematics, University of Arizona; C. Richard Johnson, Geoffrey S.M. Hedrick Senior Professor of Engineering, School of Electrical and Computer Engineering, Cornell University; Mary Schafer, Associate Conservator of Paintings, Nelson-Atkins Museum of Art; and John Twilley, Andrew W. Mellon Science Advisor, Nelson-Atkins Museum of Art

Art historical debate has percolated for more than half a century over the identity of the four Bacchanals (1635-6) commissioned from Nicolas Poussin by Cardinal Richelieu for his chateau in Poitou, France. Three of the four subjects have been identified as the Triumphs of Pan, Bacchus, and Silenus, respectively. The success of this commission led to demand for the production of copies close in date to the originals, some of which are represented in major collections. There has been general consensus that *Triumph of Pan* (National Gallery of London, NG6477) was an original part of that commission. However, the status of *Triumph of Bacchus* (Nelson-Atkins Museum of Art, 31-94) as the original commissioned version has at various times been doubted, in spite of sharing a common provenance with *Pan* until 1850. An incomplete early provenance and apparent stylistic discrepancies, particularly in relation to *Pan*, have caused serious doubts about the inclusion of *Silenus* (National Gallery of London, NG42) among Richelieu's original commission. It is today classified by the National Gallery as a painting "after Poussin."

In preparation for the Nelson-Atkins' catalog of its French painting collection we sought to employ recent innovations in computerized "thread counting" for automated analysis of canvas weave variations to resolve the status of the Nelson-Atkins *Bacchus*. This approach has proven particularly powerful in demonstrating commonalities and distinctions between canvases of nominally identical average thread counts with art historical implications, as among the paintings of Vincent van

Gogh (*The Burlington Magazine*, February 2012), court portraits by Velazquez (*The Burlington Magazine*, September 2012), and paintings by Johannes Vermeer (*Metropolitan Museum Journal*, 2012).

Automated weave comparison held the potential to settle the questions surrounding *Bacchus* in the event that the artist had employed part of the same bolt of canvas for *Pan*. Existing National Gallery radiographs of *Pan* were digitized and made available for our comparison with *Bacchus* through this process, resulting in a very close match of their warp thread-spacing variations (imposed primarily by the loom and resembling a bar code when color-coded and mapped). When subsequently performed on radiographs provided for the National Gallery *Triumph of Silenus* its warp spacing variations were also matched

to a very high degree with those of *Pan*, providing compelling evidence that all three paintings were executed on sections of the same bolt of canvas. This form of evidence, connecting the three works to a single canvas as it does, relates them more closely than other forms of analysis might, such as a demonstration of the shared use of a common set of pigments, and is unaffected by variations in condition of the paintings. This outcome should lead to a significant reassessment of *Silenus* and, more generally, of the criteria upon which scholarly opinion has been formed in attempting to resolve questions of authorship among roughly contemporary Old Master paintings. A comparison of painting materials and working methods employed for *Bacchus* and *Pan* is now proceeding, which will be underpinned by the certainty that they were contemporary products of the same studio.

JOINT SESSIONS: TEXTILES + WOODEN ARTIFACTS

Challenges and Compromise: Preserving the Miller House Textiles

Kathleen Kiefer, Senior Conservator of Textiles, and Bradley Brooks, Director of Historic Resources Indianapolis Museum of Art; Wendy Richards, IMA Scholar in Textile Conservation, Indianapolis Museum of Art, Summer 2012

In 2009 the Indianapolis Museum of Art acquired the Miller House and Garden, an important mid-century modern residence in Columbus, IN. The house and garden were designed collaboratively by architect Eero Saarinen, interior designer and architect Alexander Girard and landscape architect Dan Kiley, at a time when each was at the height of their creative output. The house features flowing open spaces filled with light, achieved through a system of skylights, and expansive windows that integrate the surrounding landscape with the interior of the house. J. Irwin Miller, a successful industrialist, his wife Xenia, and their five children occupied the house from the time it was completed in 1957 until Mrs. Miller's death in 2008. During this 50 year period the Millers acquired many significant works of art, including Monet's *Waterlilies*, pieces by Picasso, Matisse, Bonnard, Chagall and others, but remained true to the modernist visions of Saarinen, Kiley and Girard in maintaining the house. This paper will present an overview of Girard's use of textiles in the house, our understanding of the evolution of these textiles over time, aspects of preparing the house for public access, decision making around use and interpretation, and will examine inherent characteristics of the house and their impact on preservation. Limited resources and the short time line between acquisition of the house and its opening to the public in the spring of 2011 have necessitated a phased approach to conservation and the implementation of preventive practices. These factors will also be discussed while sharing the story of our care of the house to date, and plans for expanding this care into the future.

Slipcovers: Old and New

Anne Battram, Upholstery Conservator, The Biltmore Company

The use of slipcovers has been documented in the United States as early as 1647 and even the young George Washington, before becoming the first American president, ordered "loose covers" for furniture in his newly inherited home at Mount Vernon. The worldwide appeal of slipcovers has always been one of comfort, style and function. Used in a variety of ways, slipcovers could be camouflage for worn and stained upholstery fabric. Or they could be used to protect very ornate and luxurious textiles, the outer cover removed only for important visitors. Because upholstered furniture pieces were often the dominant decorative components in a room, slipcovers also provided a relatively quick and affordable change in taste or an alternative to a more expensive fixed upholstery treatment. This fact is still true today

and is the reason that slipcovers are more popular than ever.

This paper will present the historical use of slipcovers, appropriate fabrics and the many considerations for their use. Also discussed will be a specific treatment of an easy chair c. 1815, owned by the Historic Annapolis Foundation, Annapolis, Maryland. This chair still retains its original upholstery materials after almost two hundred years, and physical evidence indicates that it had been intended only to be slipcovered. The existing layers answered questions posed by furniture historians and offered challenges for its stabilization and treatment.

Treatment of a Suite of Baroque Revival Style Seating Furniture

Genevieve Bieniosek, Furniture and Upholstery Conservation Intern, Biltmore

A suite of Baroque revival style seating furniture was treated in preparation for restoration of the second floor living hall at Biltmore, George Washington Vanderbilt's house and estate in Asheville, North Carolina.

Biltmore was conceived and built by George Washington Vanderbilt, who employed architect Richard Morris Hunt and landscape architect Frederick Law Olmsted. Boasting approximately four acres of floor space, the 250 room house was first opened to family and friends for Christmas of 1895. George's only daughter Cornelia and her husband, John Cecil, opened Biltmore House to the public in 1930. Today the property encompasses eight thousand acres of forested terrain in the mountains of western North Carolina and attracts over one million visitors each year.

Because the house is so sizeable, many unusually large suites of furniture were purchased or produced to furnish it. One such is a suite of Italian Baroque revival style upholstered furniture, composed of 12 armchairs and two settees. The pieces are heavily carved in the manner of Italian sculptor Andrea Brustolon, and likely date to the nineteenth century. In the 1970s, eight of the chairs and one settee from this suite were reupholstered using modern materials and placed in the newly-finished Music Room. The remaining four chairs and settee remained in storage, upholstered in gauffered wool plush.

At the beginning of this project, there were many questions: Was the large suite purchased new for Biltmore? Where in the house was it originally used? Is there any evidence of other upholstery treatments? The suite was also studied to determine if all of the pieces were made together; while clearly a matched set, variations in carving can be seen among the group.

Ultimately, six chairs and one settee were treated for reinstallation in the second floor living hall. This paper will present the research findings and the treatment of the furniture using minimally-intrusive upholstery techniques and the new reproduction gauffered wool plush and trim.

Two's Company: Supportive Relationships

Nancy Britton, Conservator, Metropolitan Museum of Art

A pair of documented 1826 Phyfe window benches with original under-upholstery materials belonging to the Brooklyn Museum of Art were treated for the American Wing's exhibition "Duncan Phyfe: Master Cabinet Maker in New York" at the Metropolitan Museum of Art, December 20, 2011, to May 6, 2012. The window benches retained their original webbings, baseclothes and squabs. Examination revealed different methods of corner cuts and variations in the attachments of the basecloths to the frames. These benches are of interest both in comparing the differences between them in upholstery techniques and for the treatment using a carbon fiber support system for the squabs.

The opportunity to examine multiple objects in a suite provokes discussions on the relationships between shop practices and the artisans doing the work. While this perspective has a history of scholarship in American furniture manufacture, it has yet to be seriously undertaken for historic upholstery and upholsterers. What are our interpretations when different

textile materials are used or variations in techniques between objects are observed within the same campaign? Other pairs of upholstered objects with variations found in under-upholstery techniques and materials during examination will be discussed.

To retain the historically valuable comparative information found in this pair of window benches, our treatment of the benches provided an example of the use of carbon fiber supports to protect original material without intrusive techniques while enabling appropriate replacement showcovers to be installed. Matrixes of wovens embedded in resins have been used in conservation for a number of years. The development and availability of woven carbon fiber in epoxy offers advantages over fiber glass in polyester with its higher strength-to-weight ratios and ease of working properties. The issue in the treatment of the window benches was how to support the squabs on top of the original basecloth and webbing while protecting these fragile materials from the squab weight and allowing visibility and access to the original materials. The use of carbon fiber epoxy matrix sheet for this treatment will be described. Other uses of carbon fiber and epoxy for underupholstery support systems that we used in other treatments will be discussed.

A Mixed-Media Approach to Digital Fills

Ashley Jehle, Graduate Student in Art Conservation, Buffalo State College; Jonathan Thornton, Professor of Objects Conservation, Buffalo State College; Dan Kushel, Professor Emeritus of Technical Examination and Documentation, Buffalo State College

Digital photography is increasingly being used to create fills for loss compensation on a variety of materials that may otherwise be difficult to replicate. The creation and digital manipulation of the image are important steps, but it is the alteration of the image postprinting that can really allow the fill to take on the appearance of materials very different from the paper it is printed on. For this project, digital fills were used to construct missing strap pieces for a 19th century militia knapsack and valise. The process used to replicate the aged painted leather straps is presented, although this technique may be adapted for a range of objects.

When the knapsack and valise were found to be in need of conservation treatment, the two straps originally used to hold the bags together were no longer functional. They were torn or separated into four pieces, and significant portions were missing. The leather strap pieces that remained were painted white on one side, and the paint was cracked in an intricate and random pattern overall.

Replacement strap pieces were constructed using a printed digital image manipulated to look like the aged and cracked painted leather. First, the largest existing portion of the strap was photographed, and the digital image manipulated, copied, and blended together to create longer strap pieces in Photoshop. These images were printed on Epson enhanced matte paper. To reduce the thickness of the paper, it was thinned, and the printed image was separated from the bulk of the paper. The thinned image was then applied to a backing of four sheets of Tyvek, all laminated together with Beva film. This allowed the printed image to take on more of the properties of the Tyvek, which matched the thickness and flexibility of the leather. The Tyvek was toned with acrylic paints, which also gave it a leather-like appearance. Acrylic gloss varnish was applied to the front of the fills in a dotted, mottled manner in order to give the digital image a sheen and texture that matched that of the cracked paint. The fills were adhered to the existing leather straps, and the seams were filled and toned.

With the intact straps repositioned onto the bags, the knapsack and valise can now be viewed together as they would have been worn. The addition of the Tyvek backing, paint, and varnish enhanced the effectiveness of the digital image, and the digital fill proved successful in replicating the appearance of the cracked painted leather. This project is one example of how the combination of digital editing and post-printing manipulation by hand can be used to transform a printed image into a convincing fill for loss compensation, and the technique may be adapted to reproduce a variety of other materials.

A New Method of Paper Pulp Fills for Drawings Affected by Mold Damage

Marina Ruiz Molina, IMLS Grant Recipient, Metropolitan Museum of Art

This poster will illustrate a new method that has been developed over the last two years to create fills for paper losses. This method is particularly suitable to compensate large losses in works of art that have been severely damaged by microbiological contamination. The starting point for this project was the conservation undertaken at the Paper Conservation Department of the Metropolitan Museum of Art of a large number of drawings by the Louis Comfort Tiffany Studios. This collection of designs suffered severe water damage and biological contamination before they were acquired by the museum.

A new treatment technique has been designed for this project, using paper pulp to create fills that serve very specific purposes. It is especially suited for mold damaged objects because: it reinforces strata that have been structurally compromised by biological action; it allows to fill large support losses with minimum tension applied to the original support; it helps fill thinned and abraded areas at the same time that total losses are filled; it provides planar stability in objects that, because of biological damage, include areas with differentiated hygroscopic behavior; it helps to aesthetically improve areas of paper that have been irreversibly stained by fungal and bacterial activity.

The method can be divided in six steps. The first phase consists in preparing the pulp. The types of pulps are chosen based on the qualities that are being sought. These include transparency/opacity, expansion rate, hygroscopicity, and color. Preferred pulps for this project were: cotton dry pulp board and flax dry pulp board. They contain carboxymethyl cellulose as a sizing agent and are buffered with magnesium carbonate to achieve a pH in the range of 7.5 to 8.3. Toning is performed with direct dyes. The second phase is the blending. Blending time and speed are set based on the need for an expansion/contraction rate during drying. This takes into account factors such as fiber length and amount of fibrillation achieved during the blending. The casting (third phase) is performed on a light table with the aid of a Mylar template. The template contains information on the different thicknesses that need to be reached in one single fill. Pipettes and sensory brushes are used among other tools to obtain an even distribution of the fibers and a texture that will match that of the original paper. The fourth phase consists of drying the casted fill, and it takes place on the suction table. This allows for bonds to form among cellulose fibers. By casting and drying the paper fill separately, the drawing does not need to undergo any sort of wet treatment during the filling of lost areas. The fifth phase is to adhere the fill to the artwork. This step takes place on the suction table. The artwork is pre-humidified and the fill is adhered over the damaged areas by applying with an airbrush a 15% solution of starch paste in deionized water. Finally, only if necessary, the artwork will be flattened following the regular procedure of humidifying it in a humidity chamber and applying weight for a several weeks.

A Paper-Based Alternative to the Oddy Test

Marcie Wiggins, Undergraduate Student, University of Maryland, College Park; and Eric Breitung, Library of Congress, Preservation Research and Testing Division

The purpose of this study is to evaluate cellulose sensors and ion chromatography (IC) as a viable test system for potential preservation materials in paper dominated collections. Materials used to house and preserve cultural heritage objects are often evaluated with the 'Oddy test' to ensure they are safe to use with collections. Generally, the Oddy test involves sealing a preservation material of interest in a container with water and copper, silver, and lead coupons for 30 days at elevated temperatures. The corrosion level of each metal coupon is judged relative to a control sample to classify the material as permanent, temporary, or suitable for use with collections. Although the Oddy test is simple to run and requires limited equipment to conduct, it is based on the corrosion of metals and is not necessarily appropriate for preservation materials that will be in the presence of organics such as paper, parchment, and textiles.

Because a significant portion of the Library of Congress's collections is paper-based, a paper sensor was used to evaluate preservation materials. For these experiments, 100% cellulose Whatman filter paper was exposed to a potential preservation material for 6 days at 100°C. To analyze the level of degradation of the exposed filter paper, water was used to extract the soluble components, which were then separated using ion chromatography (IC). Preservation materials, including a series of adhesives, book cloths, binder boards, and foams, were tested with both the Oddy and IC tests. The IC test for a preservation material that degrades cellulose produced a chromatogram with several peaks that were not present for the control samples. Materials that did not degrade the cellulose filter paper produced chromatograms that were very similar to those produced by the control samples. The IC results correlated to the Oddy test results with two exceptions, where the opposite use recommendations were assigned. The most notable result was a foam that was previously considered acceptable for use based on the Oddy test. This is an interesting result as it indicates that some materials may not corrode metals but, in fact, can degrade organic materials such as paper.

While the classes of tested preservation materials tended to produce different overall chromatograms, peaks at the same retention times were identified for preservation materials that contained degraded cellulose. Tests are underway to characterize the compounds responsible for those signals using mass spectrometry techniques, which will assist in our ability to interpret and use the IC chromatograms. Using these results, a methodology will be developed to calibrate the test to allow the reproducible assessment of preservation materials for use in cultural heritage institutions.

Acetic Acid Off-Gassing in Clamshell Enclosures

Allison Brewer, Undergraduate Candidate for a BFA in Art History, University of Kansas

Rare book conservators construct specialized, custom-fit, cloth-covered containers for special collections material. These "clamshell boxes" are typically constructed with binder's board and covered with a linen or cotton cloth using polyvinyl acetate (PVA) adhesive. This adhesive off-gasses acetic acid as it cures. Acetic acid is known to cause deterioration of paper and leather, common materials placed in these boxes. To reduce the effect of the gas and to decrease the concentration of the chemical, most conservators are trained to air out newly made boxes. While conservators possess substantial "folk wisdom" and anecdotal evidence on the value of airing clamshell boxes, to date there are no published studies on the necessity of this step. This presentation will investigate the use of Acid Detection strips (A-D strips) to study acetic acid off-gassing occurring in custom-made, cloth-covered book boxes constructed and used by conservators in research libraries.

Solutions to reduce the impact of the gas include airing out the boxes by standing them upright with the trays opened for a period of days and replacing the PVA with potentially more benign adhesives such as methylcellulose, acrylic adhesives (Lascaux 498HV), and wheat starch paste. To answer the off-gassing question, A-D strips designed by the Image Permanence Institute were tested. The A-D strips consist of a colored strip with a pH indicator that changes color from blue to green, and finally to yellow as the levels of acetic acid gas increase. While designed for motion picture film and negatives, A-D strips have been used in other conservation applications such as testing materials used in exhibit cases. This study indicated that the color change of A-D strips happens between 24 hours and several weeks or months, depending upon the gas levels present.

To test off-gassing potential, sample size components of the clamshell boxes were placed in glass stoppered jars along with an A-D strip. Some adhesives showed an immediate change in acidity. The jars were then left alone but periodically checked at 24, 48, and 72 hours, as well as one, two, and four weeks. Fifteen partially made clamshell boxes were constructed and aired out for 24 hours prior to being sealed in an inert bag with an A-D strip placed inside each tray. The bagged trays were checked at 24, 48, and 72 hours, and one, two, and four weeks.

The Acid-Detection strips proved effective in detecting acetic acid off-gassing in the enclosures and sample materials. Results from monitoring reveal differences in off-gassing severity among various types of PVA, boards, and cloths studied. The poster will provide details about how specific, commonly used materials fared during testing and suggest areas for future study.

Batch Treatment of Special Collection Books

Lauren Calcote, 2012 Graduate of the Art Conservation Department, Buffalo State College

Special collections libraries often face the challenge of needing to stabilize large numbers of books with limited staff time. In special collections conservation, each book is traditionally documented and treated as an individual. This process works well for extensively damaged books, but can be overly time consuming for lesser treatments. Books that have the same type of problem can be treated as a batch to reduce the treatment time per volume while still keeping adequate documentation to meet the AIC Code of Ethics. This paper will discuss the questions of how to choose books for batch treatment, documentation for the treatments, as well as some treatment methodologies for those types of treatments as used in the University of Michigan Library Department of Preservation and Conservation

The books chosen for batch conservation need to have similar problems and materials so that they require the same treatment. Standards are set up for selecting books appropriate for the project before treatment begins and a standard treatment methodology is written out. In addition, a general examination is preformed, in our case using a checklist, to mark all the materials and techniques used in the books, the condition issues, and later, the materials used in treatment.

Photography is also an important part of the documentation process. Photos representing the types of damage or anything noteworthy can be taken using a small digital camera. This option does not require the time or space necessary for more formal documentary photography but records the initial and final condition of the volumes.

To date, two different types of treatments have been batched at the University of Michigan: rebacks to leather hollow-backed books with detached boards and spines, and board reattachment to leather tight-back books. In the coming year, there are plans to do batch work on cloth bindings with similar problems.

Some of the books initially identified as good candidates for batch treatment on the shelf may turn out to have more extensive damage on examination in the lab. Generally these have torn or damaged paper too extensive for batch treatment. These books may be pulled out of the batch for individual documentation and treatment.

Beverly Pepper's Denver Monoliths and Concrete Artificial Rock Construction

Kate Moomaw, Assistant Conservator for Modern and Contemporary Art, Denver Art Museum

In 2012, the Denver Art Museum undertook an investigation and maintenance treatment of the Denver Monoliths by Beverly Pepper. The sculptures were fabricated and installed outdoors at the museum in 2006. The two structures making up this artwork, one 42 feet tall and the other 31.5 feet tall, are constructed of cast

glass fiber reinforced concrete (GFRC) panels and shotcrete on a steel armature. Similar construction methods are used to create naturalistic landscapes in zoos, botanic gardens, and museums. This construction technique can be expected to show up in artworks and collections with increasing frequency.

Between 2006 and 2012, the coloration of the surfaces of the Denver Monoliths changed significantly, and a network of cracks became apparent around the GFRC panels. To determine a course of treatment, the conservation department worked with a structural engineering firm and companies specialized in concrete artificial rock construction and maintenance. The engineering assessment concluded that the cracks around the GFRC panels did not undermine the structural integrity of the sculptures and could be considered a cosmetic issue. The pros and cons of treating the cracks were weighed, and it was decided to only treat the discoloration of the surfaces for the time being. A company specialized in artificial rock construction was contracted to recolor the surfaces with exterior grade acrylic dispersion paint with a flat finish, which was diluted and spray applied. A silane sealant was then applied to repel water from the surface and fine cracks.

This poster will detail the investigation of the sculptures, the weighing of treatment options, the treatment undertaken, and the materials and construction methods used to fabricate the Denver Monoliths.

Community Engagement in the Conservation of a War Museum Collection

Jennifer O'Connell and Sophie Lewincamp, Centre for Cultural Material Conservation, The University of Melbourne

This poster will demonstrate community engagement in conservation through a collaborative project in Australia between two universities and a community war museum. The project planning, logistics, and workings of this exercise can be shared and used as an affordable solution to large scale community conservation projects as well as a teaching and learning opportunity for students. More importantly, it is an approach to conservation that engages the custodian with the conservator. The project demonstrates a contemporary approach to conservation through the matching of services with the client's conservation needs.

The War Museum, located in Narrabeen, New South Wales, contains over 5,000 objects donated by past and current residents and families of the Returned Servicemen's League (RSL) LifeCare retirement village. The War Museum collection contains items from the Boer War, World War I, and World War II to present day conflicts and peacekeeping missions. The collection is being conserved by volunteer conservation students and supervised by teaching staff and professional conservators from major institutions. The project offers the museum an economically viable solution to the conservation of its heritage collection through the employment of student volunteers (rather than professional conservators) and the universities with an

opportunity to provide vital training for students. As the project is taking place on site, the custodians of the museum are able to be involved in different stages of the project, particularly in contextualizing the collection.

In consultation with the RSL residents, students have been cataloguing and assessing all items to create a collection catalogue complete with donor information and conservation priorities. As the museum is located within the village, residents whose donations are in the collection are able to drop in while the students are working and discuss use and provenance. For instance, residents have helped with the identification of particular military plane models. Conservation students have designed posters on care and handling of museum objects to display in the museum for training purposes and to engage the residents in preservation and conservation of the collections. Residents have been assisting students by sewing new enclosures for delicate textiles.

Since the project's inception in early 2012, a collection database has been created, oral histories are being recorded, and the collection is receiving conservation care. The community engagement has been integral to the project and there have been many adjustments along the way to ensure this continues smoothly. It has been found that communication has been one of the major areas of learning for the project. Regular meetings with the museum committee ensure that the community's needs are met. Ensuring residents remain engaged in the project is crucial and has been achieved through project updates in the form of presentations, fliers, and attendance at community events.

A conference poster of this project will showcase the collection, community engagement, and outcomes such as the database and new museum displays integrating oral histories.

Conservation of Shelburne Museum's 1926 Artizan Carousel Organ

Richard L. Kerschmer, Director of Preservation and Conservation, and Nancie Ravenel, Objects Conservation, Shelburne Museum

In 2007, Shelburne Museum received a grant from the United States Institute of Museum and Library Services to conserve its rare 1926 Artizan Style "A-2" Military Band 46 key organ and 27 decorative painted panels from its 1902 Dentzel carousel. This project was an extension of the conservation treatment of the carousel's 40 animals that has been in progress for the past 20 years.

Carousel organs are routinely restored, but seldom conserved. In the United States alone, there are dozens of skilled artisans who eagerly and expertly repaint faded organ facades, rebuild organ pipes, bellows and mechanisms, replace worn mechanical parts, and strip and refinish varnished wood surfaces. Some even modify the original player mechanisms to play modern melodies from iPods. Every summer, owners of restored organs tour the country playing their instruments at rallies across the nation.

Shelburne Museum's organ had been stored in an unheated shed for over 50 years, and it was still in surprisingly good condition. The museum's treatment goal for the Artizan "A-2"

was to conserve the instrument to preserve evidence of use, maintain as many of the original components as possible, and yet restore it to working condition to play original roll music for the public for 5-10 minutes a day. In other words, we were interested in a combination conservation/restoration treatment for our Artizan organ.

To this end, we assembled a team consisting of a musical instrument conservator, an organ restorer, and a carousel organ restorer to advise and assist Shelburne's two objects conservators in the treatment of the carousel organ. Various configurations of this team met several times over three years to work on this instrument. Shelburne's Objects Conservator performed the majority of the conservation treatment, cleaning dirt from the painted façade, removing vast amounts of mouse nesting material from the bellows and windchest, cleaning and degreasing the operating mechanism, and replacing deteriorated rubber tubing. The musical instrument conservator advised on documentation and ethical considerations and assisted the organ restorer and Shelburne's conservators in disassembling the organ. The organ restorer repaired broken wooden pipes. The carousel organ restorer rebuilt selected pneumatic components, replaced only the damaged air pouches, and designed and built a new historically accurate motor assembly to return the organ to playing condition. He also advised on reassembly, aligned the tracker bar, and tuned the instrument. Shelburne's Director of Preservation and Conservation coordinated the project and assisted with disassembly and reassembly.

This project was a model of collaboration with all participants learning from each other. The poster will address the decision-making process, the conservation/restoration procedure, the lessons learned by participants, the exhibition/presentation of the carousel organ, and the public's reaction to the appearance and sound of the functioning carousel organ playing "the happiest music on earth."

A video of the organ playing during tuning is at <http://www.youtube.com/watch?v=IDm7RLiuRDw>.

Contemporary Issues in Conservation: Making Conservation an Accessible Discipline

Jessica Caudill, MA Public History Candidate, East Carolina University, and Susanne Grieve, Director of Conservation, East Carolina University

The world was not built for people with disabilities. This is a statement that I have learned through personal experience to be true because I was born with a congenital disease called Muscular Dystrophy. Throughout my life I have learned to adapt to my surroundings in order to function successfully. Now as I am entering the work force, I am faced with new accessibility challenges. I was introduced to conservation when I began researching archaeology as a potential undergraduate major. I knew that going into the field would be extremely difficult for me due to the nature of the work required. I then learned that

once artifacts were excavated they were sent to conservators for treatment. I realized that in the field of conservation I could have the best of both worlds; I could work with artifacts and have an accessible lab environment.

This paper focuses on my personal experiences of making conservation an accessible field and presents a viewpoint from an educator within the field. I have included suggestions regarding making lab environments more accessible for people with physical challenges. I have learned that making environments more accessible for people with disabilities also improves the quality of the workspace for all who use the space. My hope in this project is to raise awareness about persons with disabilities working in conservation. I am looking forward to working in the field of conservation and cannot wait for future opportunities to share my experiences.

Contextualizing the Japanese Textile Collection at RSL ANZAC Village War Museum, Narrabeen, to Inform its Display and Long-Term Preservation

Lisa Yeats, Recent Graduate of the Masters of Materials Conservation course, Centre for Cultural Materials Conservation, The University of Melbourne, Australia

Soldiers often return home from war with souvenirs of conflict. These objects enter museum collections either via donation from veterans directly, or their families. When objects from private soldiers' collections get donated to a museum, such as RSL ANZAC Village War Museum, Narrabeen, a holistic and sensitive approach to their conservation and display is favorable as there are many complex factors to consider.

The Returned and Services League (RSL) Australian and New Zealand Army Corps (ANZAC) Village in Narrabeen, Sydney Australia is currently home to over 5000 residents and community care clients, making it one of the largest providers of retirement and aged care services in Australia. The Village is home to a volunteer run War Museum with a collection that has been compiled through donations of items by current and former residents. Since January 2012 the Centre for Cultural Materials Conservation (CCMC) in Melbourne, Australia has been implementing a cataloguing and conservation program at the RSL Village War Museum employing Masters students from the University of Melbourne. One of the main objectives of the project is to reinvigorate the role of the Museum in the lives of the residents. There are also plans to relocate the museum to a more central building within the Village by 2014.

Among the museum's collection are textile objects understood to be of Japanese origin that were souvenired by Australian servicemen, and later donated to the museum. This specific collection includes objects that once belonged to Japanese soldiers such as photographs, flags and swords, as well as objects that were brought back from surviving prisoners of Japanese run camps such as a loincloth, medics badge and sandals.

This poster is the subject of a larger Masters' thesis that focused on devising a holistic conservation plan for the Japanese textile collection at the RSL ANZAC Village War Museum, Narrabeen. A Japanese "battle flag" or *hinomaru yosegaki*, "thousand-stitch belt" or *seminbari*, and "booby trap doll" or *masukotto ningyo* were used as a case study throughout (refer to images on p. 3). The initial phase of the investigation into the objects involved noninvasive examination, literature reviews and interviews with residents and museum professionals to provide a cultural, historical, and social context to the objects. The materials used in the manufacture of the three objects were also instrumentally analyzed using optical microscopy and FTIR-ATR spectroscopy.

The information gained from initial noninvasive methods has provided a historical, social and historical context while the interviews encouraged engagement of RSL ANZAC Village residents with the collection. The material characteristics obtained through instrumental analysis allowed for relevant recommendations to be made regarding the collections long-term preservation and display in the new museum building.

Cooperation Creates a Custom Crate: Conservation, Laser Scanning, 3D Milling, and Crate Building Work Together

Lynda Zycherman, Conservator of Sculpture, Museum of Modern Art; and Steven K. O'Banion, Smithsonian Conservation Fellow, Hirshhorn Museum and Sculpture Garden

Claes Oldenburg's *Red Tights with Fragment 9* (1961) is created from a single piece of contoured chicken wire, over which pieces of plaster-coated textile were draped and then painted. The sculpture hangs on the wall from a coat hanger embedded in the plaster. The fragility of the sculpture has been documented over the 50 years it has been in Museum of Modern Art's collection. The edges in particular have been consolidated, filled, and inpainted in several campaigns. For a major Oldenburg retrospective, the sculpture was requested for a five-venue international exhibition lasting two years. We judged this sculpture unsafe for travel in the hanging orientation. Laying the work flat for travel seemed safer, provided that we could develop a packing system that would adequately support the sculpture without touching the edges.

To design a custom-contoured bed that would prevent horizontal movement in two directions, we commissioned a laser scan of the reverse. An imaging company transformed the scan into a milled polystyrene support, whose contour closely matched the underside of the sculpture. The crate builder recommended that the scan be cut into five sections for ease of fitting and handling of the sculpture. The milled support bars were made narrower than the sculpture, so that the edges were free. The custom bed held the sculpture in place inside the crate, so that it did not shift front-to-back or side-to-side. In a few locations positive pressure was applied from horizontal bars with pendant blocks in order to prevent up-and-down motion of the sculpture during transit.

The design was successful and the sculpture arrived at the first venue with no travel damage.

Does That Root Have an MSDS? Obstacles and Opportunities Observed in Developing a Reference Collection of Historic Organic Colorants

Cindy Connelly Ryan, Preservation and Testing Division, Library of Congress

Instrumental identification of organic colorants forms an active and challenging area of research in the analysis of cultural heritage materials. While current advances in instrumentation permit increasingly detailed analyses of increasingly small samples, difficulties persist, particularly when analyzing non-homogenous or multi-component original materials and materials that have undergone alteration over time.

An additional obstacle is the lack of well-characterized reference specimens appropriate to naturally aged samples or to historic production methods. Plant-based organic colors declined rapidly in commercial importance after the introduction of synthetic colorants derived from coal-tar compounds in the 1850's. Thus, analytical reference spectra for now-obsolete plant colorants are largely not included in modern spectral libraries, complicating their identification on objects in collections. Where reference spectra are available, they reflect isolated, purified compounds of recent manufacture, which do not well describe a degraded sample containing natural impurities combined with a medium on a substrate.

As part of the overall Center for Library Analytical Scientific Samples (CLASS) initiative, the Preservation Research and Testing Division of the Library of Congress has recently developed a project to enhance our micro-sampling and noninvasive analytical capabilities by developing a collection of reference specimens of organic lake pigments. These samples serve as reference standards for analytical studies of collection items. They will also serve as experimental samples to study the stability and preservation needs of Library collections incorporating organic colorants. Our initial focus is the material culture of the colonial and early Republic period of American history, a key area of the Library's holdings. To date this is a period that has been less extensively investigated than earlier eras. Project-specific sets of samples are also being created as needed, as collection items come to the lab for analysis, including yellow *ukiyo-e* printing colors, 16th century European mixed-green and yellow colorants inks, and mixed or layered inorganic red manuscript paints.

This paper will discuss criteria that define "ideal" reference specimens, the development and optimization of standardized preparation protocols for non-standard materials, perils and pitfalls of period nomenclature, and case studies illustrating the applications of reference specimens to analytical questions. Some of the challenges of working with historic colorants will

be discussed, including locating sources for obscure plants of little commercial value, and meeting health, safety, and regulatory compliance requirements when working with materials of significant or unknown toxicity.

Exploring the Impact of Slag on the Corrosion of Archaeological Iron

Eric Nordgren, PhD candidate, and David Watkinson, Head of Conservation, Cardiff University, UK

The contribution of chloride salts to the corrosion and destruction of archaeological wrought iron artifacts has been well documented in the archaeological conservation literature. However, the effect of metallurgical structure and composition on the chloride-induced corrosion of wrought iron is less well understood. Wrought iron is composed mainly of α -iron (ferrite), with glassy slag inclusions in varying compositions and morphologies. The metallurgy of iron is readily evaluated by microscopy and instrumental analysis and may have important implications for its post-excavation preservation, as chloride has often been found concentrated around slag inclusions near the surface of the corroded metal.

Research currently underway at Cardiff University will study the metallurgy and chloride content of 180 wrought iron archaeological nails from the sites of Roman Caerleon in Wales, UK, Colonial Williamsburg, Virginia, and the shipwreck of the Queen Anne's Revenge (1718). The stability of the samples will be assessed by measuring their corrosion rate with and without desalination treatments to remove chlorides. The relationships between corrosion, chlorides, slag inclusions, and desalination treatments will then be investigated. The large sample size will allow for statistical treatment of the data in order to gain a greater understanding of the corrosion behavior of archaeological wrought iron and inform practical decision making for the conservation and collections management of archaeological iron assemblages.

Fat Content in Collagen Based Adhesives: Assumptions and Investigation Results

Sofia Rydell, Assistant Furniture Conservator, Period Furniture Conservation

Collagen based adhesives with high fat content, such as rabbit skin glue, play a peripheral role within the field of furniture and wood conservation. The limited use of this category of adhesive primarily rests with the assumption that the percentage of fat is the determining factor in their low adhesive and cohesive qualities. Since there are very few published reports on this aspect of collagen adhesives, the substantiality of these assumptions have not been verified.

This presentation will outline the practical meaning of fat content in collagen based adhesives, based on Sophia Rydell's

masters' thesis work, "The Role of fat Content in Gelatin Based Adhesives – An Investigation into how the Fat Content affects Physical Properties," published in 2011. It investigated the relationship between physical properties and fat content in collagen adhesives. Testing results indicated that an increase in fat content lowers the melting point and viscosity, characteristics that can be important in hot melt adhesives. More importantly, results also indicated that an increase in fat content will improve the flexibility and strength of a wood joint.

Should the perception of high fat adhesives be revised? While gelatin was the material used as the experimental model for collagen adhesives, the work additionally highlighted the possibility of using gelatin as a wood adhesive. The circumstance when a high fat adhesive will offer an advantage over a lean adhesive will be brought to light, as well as its potentials and limitations.

Investigating the Internal Structures of Gessoes with X μ CT

Ashley Freeman, Michael Doutré, and Alison Murray, Art Conservation Program, Queen's University; George Bevan, Department of Classics, Queen's University; and Laura Fuster-López, Instituto Universitario de Restauración del Patrimonio, Universidad Politécnica de Valencia

Gessoes are widely used to prepare the support structure of artworks for the application of paint, both by the artist as a preparatory layer and by conservators to fill losses. Traditionally the term gesso refers to white particles, such as chalk or gypsum, bound with an adhesive, such as hide glue. Previous work has examined the chemical and physical characteristics of gessoes. Little work, however, has focused on the three-dimensional, internal morphology of these materials. In the present study, the internal structure of a calcium carbonate and rabbit skin glue gesso was scanned by x-ray micro-focus computed tomography (X μ CT), and from the resulting series of two-dimensional images, a three-dimensional volume or computer model was generated. This process could facilitate a greater understanding of this extremely common material. For example, 3-D modeling capabilities using X μ CT may help elucidate details such as: the porosity of the material; how the gesso interacts with the paint layer; how the gesso may facilitate movement of mobile materials, such as in-painting media and cleaning solutions applied during conservation treatments; and how physical damage may occur and propagate.

Loosening Tightly Bound Records for Digitization

Steven Loew, Book and Paper Conservator, National Archives and Records Administration; and Gail Harriman

The National Archives is digitizing the records of the Confederate States of America in its holdings (Record Group 109), most of which are bound. Some of these bindings date from

the Confederacy, and were rebacked in the 1940s by NARA staff, reinforced with new spine linings and/or cloth hinges, and often given new endpapers. Other bound volumes that were originally sewn through the fold or oversewn were later side sewn or partially oversewn by hand in the 1940s, including heavy buckram hinges sewn onto the shoulders, before being case bound into buckram covers.

Volumes that are bound too tightly to access all the information on each page are routed to conservation to modify these bindings so that they more freely open and can safely be digitized. Although complete disbinding would provide ideal access for scanning, this process is labor intensive and slows down the digital work flow. It is also preferable to retain the bound format to keep the records in their correct order and maintain historical authenticity. Gail Harriman developed and applied these approaches to loosen bindings for reformatting projects such as the Freedman's Bureau records and during other micro-filming or scanning projects.

We have devised several methods for loosening bindings, which are illustrated on this poster. Some of the methods included: cut the 1940s side-sewing or oversewing; cut and remove the cloth hinges sewn onto the shoulders of the volume; partially or entirely remove the spine linings added in the 1940s; and remove PVA glue from spines by applying heat.

After the bindings are sufficiently loosened, volumes can be scanned as is, or with the aid of special cradles used to help hold them open to help access information in the gutters.

In instances where the covers are partially or entirely detached from their text blocks in order to remove sewing and/or spine linings, the volumes are routed back to conservation after scanning to reattach the covers.

Molecular Modeling and Conservation

Erica Stafford, Sarah Balinskas Fine Art Framing

In contemporary conservation the gap between the bench and laboratory is being bridged. Practicing conservators are becoming more science savvy, and conservation scientists are becoming more aware of treatment. One form of contemporary technology that merges both the visual and scientific aspects of conservation is molecular modeling. Molecular modeling as a discipline has made significant improvements in capabilities and sophistication in the last thirty years. As a simulation tool, molecular modeling is at a point where it can and should be utilized by disciplines outside of the quantum molecular sciences. Conservation has always been a diverse and interdisciplinary field, inspired by a plethora of information, materials, and tools. As conservation already uses analytical chemical techniques, it seems a logical progression to use a more theoretical chemical tool. Molecular modeling, like conservation, is a balance of hard, calculated, scientific data and keen visual observations. As a tool, molecular modeling seems a sympathetic mix of science and visual data that could be very beneficial and useful to conservation. Within the

graduate research, “An Exploration of the Intermolecular Relationship between Soot and Cellulose via Molecular Modeling”, molecular modeling was used to explore initial research into the chemical relationship between soot and cellulose. For this research the amorphous cellulose region of paper was modeled within HyperChem Professional 8.0. Polyaromatic hydrocarbons (PAH) are the primary surface structure that facilitates potential bonding of a soot molecule. The modeled amorphous cellulose system was therefore exposed to the polyaromatic hydrocarbon (PAH) anthracene. After running a series of geometry optimizations, conclusions about the chemical relationship between amorphous cellulose and anthracene could be made.

One of the strengths of molecular modeling is that unlike in analytical techniques, where it is important to have an idea of the data desired and likely to be found, one can build molecular systems and run calculations without having to hypothesize a likely outcome. This is useful within initial research where a definite hypothesis may not be possible. The main strength of molecular modeling for conservation is the merging of quantitative and qualitative data. The algorithms used by the software produce hard data often expressed as calculated energy levels. More importantly, the software also produces detailed, three dimensional visual images. This data plays to the visual interpretation skills, which are vital and cultivated within conservation. Therefore, the images and observable data produced seem engaging and accessible for conservators regardless of their level of scientific background.

As shown in the graduate research referenced, molecular modeling has the capacity to be used for research within the conservation field. Adding molecular modeling to the repertoire of experimental techniques in conservation can aid in initial research, as well as questions and topics that are difficult to explore through analytical techniques. Molecular modeling adds to the inspiration, innovation, and creativity that makes research in the field of conservation interesting, exciting, and contemporary.

Monitoring Museum Collections Environments Using Wireless Technology: A Case Study

Gretchen Anderson, Head of the Conservation Division, Carnegie Museum of Natural History; Paul Kreitler, Project Engineer, Landmark Facilities Group, Inc; and John Lyon, Operations Manager, Carnegie Museums of Pittsburgh

Most museums are challenged by their climate-control systems and require a reliable way to track the environmental conditions of their collections. Conservators, collections managers, and facilities managers have a wide range of tools available for tracking these conditions, including: thermometers, humidity indicator cards, hygrothermographs, and data loggers. Data collected from these tools accumulate into piles of paper that are difficult to manage and interpret. Extreme swings in temperature

and relative humidity and climate-control equipment failures can sometimes go unnoticed for weeks when using stationary tracking equipment.

Another available tool is the wireless data logger. Wireless data loggers offer real-time data collection and management that simplifies the monitoring process. However, until recently, the high cost of wireless data loggers has made them a prohibitive option for most institutions. Improvements in wireless technology have dramatically lowered the costs and opened the door for large-scale installations.

With the assistance of Landmark Facilities Group (LFG), the Carnegie Museum of Natural History (CMNH) installed a wireless monitoring system consisting of over 50 data loggers in three buildings. The loggers create a wireless mesh-network in each building that delivers the temperature and relative humidity data to a central computer. The central depository dramatically reduces the staff time required for collecting and processing the data. It also improves the ability to share data between collection staff members and can provide alarms when collections conditions are beyond their desired range.

The CMNH was awarded an IMLS-CPS grant to conduct an environmental survey of the museum’s buildings and collections. The project was a collaboration of the CMNH Conservation Department and the Carnegie Facilities, Planning and Operations Department. The goal was to develop a comprehensive and effective environmental monitoring system that could help identify environmental risk factors threatening the collections and the landmark museum building. Working closely with consultants from LFG, CMNH will use the data to benchmark the existing collections environments, identify any deficiencies, and develop management strategies to improve conditions within the landmark facility.

This paper discusses the wireless technology used for the monitoring survey and the challenges faced during deployment in the complicated Carnegie Museum buildings. It then presents examples of how the wireless technology improved the data management process for the museum staff and helped them correct environmental problems promptly. The paper concludes with a discussion of the findings and the facilities management practices they influenced.

My Friend Flickr: How a Reservoir of 6 Billion Images Can Shape the Work of Restoration

Barbara Mangum, Conservator, Sculpture and Decorative Arts Conservation, LLC

Flickr, the online photo-sharing website owned by Yahoo is now hosting 6 billion photographs around the world, many of which are available for viewing and nonmember downloading. Organizations such as the Library of Congress are adding historical photos to Flickr daily, in addition to the thousands of images downloaded daily by amateur photographers. For this

conservator, the website has become an essential tool to aid in the restoration of works of art. This talk will focus on two case studies where the photographic images hosted on Flickr helped in the reconstruction of damaged sculpture: The first will examine the restoration of an extremely weathered marble monument, Hygeia, in Mount Auburn Cemetery. Restoration was enhanced by utilizing images from a Flickr collection taken by a fan of Edmonia Lewis, the monument's sculptor. Fortunately, this person and other members of the public chose to download their images onto the website, enabling relative ease in searching for comparative pieces by the artist and older photographs of the monument. The second case study is that involving the restoration of a cemetery monument in bronze (sculptor unknown), which was cut apart in 2010 by vandals who hoped to sell the piece for scrap metal. Again, images found on Flickr were very useful in establishing the appearance of the sculpture before it was damaged. In both cases, the images used within the application of Adobe Photoshop led to successful reconstruction of the works of art.

Near-Infrared Reflectance Spectroscopy of Paint Binding Media

Kathryn A. Dooley, Department of Electrical and Computer Engineering, George Washington University, and National Gallery of Art; Carolyn Carta, National Gallery of Art; Julian Rocha, Department of Chemistry, George Washington University; Maya-Jean Pause, Department of Chemistry, George Washington University; John K. Delaney, Department of Electrical and Computer Engineering, George Washington University, and National Gallery of Art; Costanza Miliani, CNR-ISTM & SMAArt c/o Università di Perugia, Dipartimento di Chimica; Marcello Picollo, Institute of Applied Physics "Nello Carrara", National Research Council (IFAC-CNR); Suzanne Lomax, National Gallery of Art; and Murray H. Loew, Department of Electrical and Computer Engineering, The George Washington University

Fiber-optic reflectance spectroscopy (FORS) in the visible and near infrared (350–2500 nm) can be used to non-invasively assess many of the pigments present in works of art. Recently, various groups have shown that it can also be used to provide information on paint binders such as drying oils and proteinaceous materials. As part of our NSF grant to construct a hyperspectral camera for identifying and mapping paint components in situ, we are constructing a spectral database for reference. The database consists of near- and mid-infrared reflectance spectra. The first set of test panels examined was prepared using materials and methods typically found in early Italian paintings. Paints were prepared using a variety of pigments in four different binders: egg yolk, egg glair, gum arabic, and animal skin glue. FORS measurements of the test panels were used to determine the spectral differences among the four organic binders. For egg yolk, the most distinguishing spectral features are a doublet near ~2307 and 2347 nm due to a combination of methylenic stretching and bending [$\nu(\text{CH}_2) + \delta(\text{CH}_2)$]. Another doublet due to the first

overtone of methylenic stretching [1^{st} overtone $\nu(\text{CH}_2)$] appears near ~1725 and 1760 nm. For egg glair, the lipid content is much lower than egg yolk, and thus the methylenic features near 2300 nm are not noticeable. The 1^{st} overtone $\nu(\text{CH}_2)$ is shifted to lower wavelengths near ~1690 and 1735 nm. The differences between egg glair and animal skin glue are subtle. In our test panels, the combination stretching and bending modes of NH [$\nu(\text{NH}) + \delta(\text{NH})$] appear at ~2042 nm in animal skin glue, but are usually greater than 2050 nm for both egg glair and egg yolk. The last binder, gum arabic, a mixture of polysaccharides and glycoproteins, has an absorption feature near 2090 nm due to polymeric O-H, which is characteristic of carbohydrates. The absorption near 2090 nm creates distinct shape differences in this spectral region for gum arabic when compared to the other binders. Gum arabic also exhibits strong water absorbance at ~1450 and 1935 nm. In addition to analyzing the binding media on test panels, FORS has been used to investigate several paintings in the National Gallery of Art's collection. Our most up-to-date results will be presented.

Negotiating Obsolescence in a Functional Media Sculpture: Nam June Paik's *Untitled (Piano)*

Emily Hamilton, Assistant Objects Conservator, Saint Louis Art Museum; and Glenn Wharton, Time-Based Media Conservator, Museum of Modern Art

Untitled (Piano) by Korean-American artist Nam June Paik (1932–2006) is a mixed-media work that was the recent subject of a major conservation intervention at the Museum of Modern Art (MoMA). The work was originally composed of an upright player piano that plays loud show tunes; fifteen CRT monitors that show two psychedelic looped videos with imagery from the life of John Cage and content from two live-feed video cameras; two U-Matic tape playback decks; and a floodlight on a tripod. When the work was exhibited at MoMA in 1994, the two looped videos were migrated to laserdisc with Paik's consent, and consequently two laserdisc players replaced the original U-Matic players. During this exhibition and a later exhibition in 2007, a faulty driver in the PianoDisc player, an obsolete system designed for floppy disks, presented problems. The piano was operational during installation, but there was extensive damage from overuse to the hammer mechanisms.

Because of the artist's experimental practice in which he encouraged variation and the participation of others in producing and installing his works, conservation research and decision-making was far from straight forward. The conservators researched technical options and gathered opinions from MoMA curator Barbara London and Jon Huffman of the Nam June Paik Studios about the presentation and long-term care of the work. Critical questions included the display of obsolete playback equipment and parameters for future conservation interventions. Treatment involved identifying an appropriate

player piano repair facility to remove the obsolete playback technology and installing a functional digital player system, as well as to stabilize and repair the piano itself. The CRT monitors were surveyed and repaired, backup CRT monitors and video cameras were acquired, and the video elements were remastered in collaboration with the Nam June Paik Studios.

This poster will address the practicalities of undertaking an extensive media sculpture conservation project with a focus on honoring the practice of an artist who incorporated variability, chance, and distributed authority in his work.

Other Policies for the Archive: Poetic Discourses in *Videobrasil* Collection

Ana Pato, Ph.D. Student, Department of History at the Faculty of Architecture and Urbanism, University of São Paulo; and Eduardo de Jesus, Professor, College of Communication and Arts, Pontifical Catholic University of Minas Gerais, Brazil

There is a lack of procedures to transcribe, translate, and save contemporary art documents in digital archives. The urgent need to manage the documentation generated in the exhibitions of contemporary art has stepped up the theoretical and artistic research around the art archive. The goal of this research is to analyze the strategies of online publication of collections of moving images, especially those coming from the video environment, using the *Associação Cultural Videobrasil* archive as a case study.

The following are the main research questions. How can we make collections with works of this nature available online? To what extent does triggering these collections with poetic and experimental operations become an important tool in the conservation of works? Does designing online collections as a place where they produce knowledge represent an important strategy for the preservation of unstable media?

The process and the policy behind the creation of the *Videobrasil* collection in 1983 were focused on works that were featured in the competitive show of the International Electronic Art Festival. Comprising roughly three thousand titles, the collection brings together an important video and performance collection produced by artists from the world's geopolitical south. Between 1983 and 2000, the *Videobrasil* collection went through a phase of critical accumulation, which was driven by an urge to preserve, keep, and rescue a media as frail as electronic media from imminent destruction. The initial proposal to establish the collection has been deeply contaminated by the lack of a cultural policy in the country and organizes itself around this absence. Towards the end of the military dictatorship period (1964-1985), Brazil was struggling to constitute itself as a democratic nation. At that same time, the *Videobrasil* collection was born with the pressing mission to qualify itself as memory.

From 2000, *Videobrasil* began the project of building an online database of its collection. The constant fear that the memory of the works and artistic documents stored in the collection could be erased resulted in a comprehensive process

of classification and digitalization of documents and works. Nowadays, *Videobrasil* has started a new policy for its collection with the understanding that this is a project of memory, and, as such, it should be articulated as a curatorial and poetic discourse.

Through the examination of the institutional and artistic practices linked to the constitution of the *Videobrasil* collection, we intend to rethink the art archive, which nowadays has defining itself in the virtual space as its central problem. We believe this is an important path to the reflection on the contemporary archive capability and our role in establishing it.

About *Videobrasil* collection: videobrasil.org.br

Publishing in Conservation Journals in Latin-America: Achievements, Challenges, and Perspectives in the Contemporary World

Dr. Isabel Medina-González, Senior Conservator, INAH

It is widely acknowledged that conservation research and intervention require dissemination in order to achieve their real potential. However, publishing is not an easy task for conservators, particularly in non-English speaking regions such as Latin-America. On the one hand, there are very few journals available. On the other hand, conservators are not often properly trained to produce a contribution for publication or even to face editorial processes. Yet, in the last few years new publications and modern media have transformed the publishing world in conservation.

What are the achievements, challenges, and perspectives for publishing in the conservation field today? This paper seeks to answer this question by analyzing the state of the art journal publications devoted to conservation that are produced in Latin-America. It evaluates the limitations and possibilities of this area of development, offering clues for improving periodical publication of conservation contributions. On the basis of this assessment, it proposes the creation of a web-based network for Conservation Hispano-speaking publications.

pXRF Analyses of Louise Herreshoff's Paintings in Relation to CdS Degradation Issues

Erich S. Uffelman, Cincinnati Professor of Chemistry at Washington and Lee University; Patricia A. Hobbs, Associate Director/Curator of the University Collections of Art and History, Washington and Lee University; Derek A. G. Barisas, senior Biochemistry major at Washington and Lee University; Jennifer L. Mass, Senior Scientist and Director of the Scientific Research and Analysis Laboratory, Conservation Department, Winterthur Museum

Cadmium yellow (cadmium sulfide, CdS) degradation is a significant problem causing conservation and treatment issues with turn-of-the-twentieth-century paintings by such notable

artists as Matisse, Munch, and Seurat. These issues include fading, discoloration, flaking, and spalling of the affected paint layers.

Louise Herreshoff Eaton (1876–1967) was an American painter who was receiving commissions by the age of nineteen and continued working until 1928 when the death of her Aunt Lizzie caused her to abruptly stop painting. Herreshoff studied art in Providence, RI, with Mary C. Wheeler and then travelled to Europe to make the grand tour. She studied painting in Paris, first under Wheeler, and then under Raphael Collin. She also studied under Jean-Paul Laurens at the Ladies Academy of the Julian. By her mid-twenties, her paintings were accepted for international exhibition in both the Paris Salon (1900 and 1903) and at the National Academy of Design (1900) in New York. Her paintings were rediscovered by the world at large in a 1976 exhibit at the Corcoran Gallery of Art in Washington, D.C. Because she quit painting precipitously when her aunt died and stored her paintings in her attic, her paintings present unusual condition issues. Many of her paintings have been exposed to far less light during their lifetimes than those created by Matisse and his Fauvist contemporaries. Consequently, Herreshoff's colors are still bold and vivid. However, due to poor humidity and temperature control for several decades, and due to some aspects of her technique, several of the paintings are exhibiting significant paint adhesion problems including flaking, spalling, and cracking. Given that many of the paintings need conservation treatment, and given the Barnes Foundation/Winterthur Museum/University of Delaware's initiatives in studying cadmium yellow photo-oxidative degradation, there was an opportunity to assess the paintings nondestructively by portable X-ray fluorescence spectrometry (pXRF) and also to obtain paint cross-sections via collaboration with private conservator Cleo Mullins.

pXRF was used to survey 33 of Herreshoff's paintings, and 26 showed positive results for cadmium. Several cross-sections containing CdS have been taken, and at the time of abstract submission they awaited preparation and analysis by SEM-EDS. Should the CdS samples show potential to shed light on the CdS degradation issues of Herreshoff's more well-known contemporaries, they may be studied further with synchrotron-based methods as part of the Barnes Foundation/Winterthur Museum/University of Delaware systematic study. The depletion of sulfur on the sample surfaces will be studied by SEM-EDS, as this was the most readily apparent symptom of the photodegradation observed in Henri Matisse's *Le Bonheur de vivre* (1905–1906).

The Herreshoff paintings are held at Washington and Lee University, where they have been a source of intense study by W&L faculty, curators, and undergraduate students. The Lenfest Foundation has been critical in forwarding the collaborative studies between Washington and Lee University and experts at Winterthur Museum/University of Delaware. The research, in addition to providing interesting results, helps expose undergraduate chemistry students to careers in cultural heritage preservation and trains those students in the area of conservation science.

Removing Modern Accretions: Hot-Melt Adhesive, Chewing Gum, and Pressure Sensitive Tape

Rebecca Summerour, Andrew W. Mellon Fellow in Textile Conservation at the National Museum of the American Indian; Sarah Owens, Andrew W. Mellon Fellow in Textile Conservation, National Museum of the American Indian; Shannon A. Brogdon-Grantham, member of the Class of 2015, Winterthur/University of Delaware Program in Art Conservation; Marian Kaminitz, Head of Conservation, National Museum of the American Indian; and Susan Heald, Textile Conservator, National Museum of the American Indian

This poster describes three conservation treatments that involved removing modern thermoplastic materials from fibers at the Smithsonian Institution's National Museum of the American Indian (NMAI). The treatments were undertaken in preparation for the exhibit, *Circle of Dance*, which opened at the NMAI in New York in October 2012. During examination of two outfits, it was noted that three types of accretions were well-adhered to fibrous components. Hot-melt adhesive and a gummy accretion were, respectively, removed from fabrics on a cuff and an apron, both of which are part of a contemporary Men's Northern Traditional powwow outfit. Black pressure sensitive tape was removed from caribou hairs on a fan from a Yup'ik dance outfit.

In the first example, hot-melt adhesive, also known as hot glue, was removed from woven bias tape binding at the edge of the cuff of the Northern Traditional outfit. The hot-melt adhesive was accidentally transferred to the cuff edge when the storage mount was made. Molten adhesive had saturated some areas of the woven tape before it cooled. After testing several methods for removing the adhesive with mechanical action, heat, and solvent, the most successful sequence was established. Excess adhesive was mechanically cut from the object, adhesive was wicked away using Hollytex and a heated spatula, and then residual adhesive was blotted away with a solvent mixture.

In the second example, a gummy accretion that appeared to be chewing gum was removed from the back apron of the Northern Traditional outfit. The suspected gum was embedded in the woven, filled wool fabric and gold lamé binding and had probably transferred to the apron during a powwow. Mechanical action, temperature reduction, and solvent application were tested for removing the accretion from the fabric surfaces. Trials demonstrated that dry ice (solid carbon dioxide) application followed by mechanical action was the most effective method to reduce the accretion.

The third treatment was the removal of black pressure sensitive tape from the caribou hair on a Yup'ik dance fan. The tape had become attached to both the long guard hairs and the shorter underfur hairs on the fan. Adhesive residue from the tape was also present on the surface of the coiled grass element of the fan. The paper tape carrier was successfully removed from the caribou hair using dry ice and mechanical action. Residual adhesive on the caribou hairs and beach grass was reduced further mechanically.

The conservation treatment of these outfit components raised interesting issues of reduction of the three different modern accretions, which are all notoriously difficult to remove. The poster describes these modern accretions, why they are problematic both aesthetically and physically, the treatment options for removal/reduction of these foreign materials, and an evaluation of the methodology.

Responsible Stewardship: Exploring Sustainability within Conservation

Christian Hernandez, recent graduate, Fashion Institute of Technology

The importance of sustainability is increasingly being mentioned in conservation literature such as the Museum Conservation Institute's 2007-2017 Strategic Plan, which commented on the fact that cultural heritage, much like the environment, require responsible stewardship. The field of conservation is currently in flux as a result of what Jonathan Ashley-Smith, former head of conservation at the Victoria & Albert Museum, calls the "adolescence of the profession." Looking through the lens of sustainability, this presentation will explore changes in conservation in regards to ethics, practices, and materials.

Ethics form the backbone of the field of conservation, and the American Institute for Conservation's Code of Ethics and Guidelines for Practice states how all risks—to co-workers, the public, and the environment—should be avoided. An artifact's conservation should not come at the undue expense of the environment; we must find the nexus between doing what is right for the artifact while doing justice to the environment. This will be explored through codes of ethics around the world, discussions with professionals, and an exploration of past changes in ethics.

In the name of preservation, conservators use energy, water, chemicals, materials, and produces waste. Perceptions about the link between caring for both the environment and cultural heritage are changing, and new information can be found throughout the field—at conference presentations, in blog posts, through scholarly articles, and informal discussions. This will be explored in-depth through examining several conservation practices, such as environmental monitoring, washing of textiles, and condition reporting with information sourced from all the previously mentioned places.

As knowledge about materials has changed, so have our perceptions of their use in conservation. The concept of a sustainable conservation material, which is rooted in AIC's Code of Ethics and Guidelines for Practice, will be explored and defined. Tips will be given on sourcing new materials and how they can be tested to ensure their safety for use in conservation with examples conducted by the presenter showing that recycled content materials Corogreen™ and Ethafoam® MRC, along with others, have passed with the same results as their widely accepted counterparts.

At the heart of both conservation and sustainable thinking is taking the short and long-term effects of our actions into

account. The long-term health of the environment ensures that there are still people to appreciate and care for cultural heritage, as well as those that create it. This presentation explores how contemporary conservation will adapt to a changing world.

Restoring an American Treasure: The Exhibition and Public Conservation of *The Panorama of the Monumental Grandeur of the Mississippi Valley*

Nicole Pizzini, Conservation Technician, Parma Conservation; Heather White, Conservation Technician, Saint Louis Art Museum; Jacqueline Keck, Conservation Intern, Abraham Lincoln Presidential Library and Museum; Mark Bockerath, Paintings Conservator, Barbara A. Buckley & Associates Painting Conservation; and Claire Walker, Assistant Painting Conservator, Saint Louis Art Museum

The moving panorama arose in the mid-19th century as a form of entertainment that was grand in both production and scale, yet whose very function served to render it unsustainable. The panorama was a moving picture well before the advent of film; a long piece of canvas with painted scenes was rolled from one spool to another, showing a progression of images. Only a handful survive today, in varying states of damage and neglect, awaiting the care of conservation professionals to revive their colorful scenes so that they may once again amaze audiences as both art and entertainment.

The Saint Louis Art Museum (SLAM) sought to accomplish this revival with its own panorama, *The Panorama of the Monumental Grandeur of the Mississippi Valley*, circa 1850. Commissioned by amateur archaeologist Dr. Montroville W. Dickeson and executed in distemper paint on canvas by Irish-born artist John J. Eagan, this 348'-long painting captivated nineteenth century audiences with its imaginative interpretations of Dickeson's excavations of Mississippian and related cultures along the Ohio and Mississippi rivers.

In the summers of 2011 and 2012, the panorama was placed on stage once again to inform and capture the imaginations of museum visitors as a team conserved it in public view. Patrons were able to experience the restoration through informative text panels, an interactive computer display, a lecture series, and personal interactions with the working conservation staff. The outreach component of the exhibition, planned as an intrinsic part of the project, was well received by the 82,000 visitors who attended the exhibition, many of whom were discovering the field of art conservation for the first time.

The poster will discuss the condition, conservation, and handling concerns of the panorama, and how its treatment was used to promote the conservation of cultural artifacts. Funding through a combination of grants enabled the construction of a scrolling mounting mechanism to accommodate the massive canvas for the treatment regimen planned by SLAM Director of Conservation Paul F. Haner and the painting's future display. The creased support of the panorama was flattened and friable paint was consolidated

prior to inpainting losses with water-soluble wax crayons. Light-fastness tests were conducted to determine the longevity of the crayons. The treatment ensures the continued appreciation of this early moving picture by contemporary audiences.

Reversibility Study of Atomic Layer Deposition Films as Diffusion Barriers for Silver Artifacts

Amy Marquardt, Graduate Research Assistant and PhD candidate, Department of Materials Science and Engineering, University of Maryland; Eric M. Breitung, Library of Congress; Richard Ash, Terry Drayman-Weisser, and Glenn Gates, Walters Art Museum; and Gary W. Rubloff and Ray J. Phaneuf, University of Maryland

In this work we investigated atomic layer deposition (ALD) to create transparent oxide anti-tarnish coatings for sterling silver objects in museum collections and evaluated an effective removal technique that minimizes surface alterations. With ALD, optically transparent, dense, ultra-thin metal oxide films are achieved that are extremely conformal to the underlying substrate. Aluminum oxide ALD films have been shown to be a more effective diffusion barrier to corrosive compounds than nitrocellulose lacquer films, which are commonly used to protect silver. Standard surface characterization techniques were used to determine the effect of the ALD application and removal on the silver surface. Metal oxide ALD films were applied to sterling silver and removed with low concentrations (<0.5%) of sodium hydroxide. The exposed solutions were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) to determine the extent of copper, silver, gold, lead, and zinc etched from the surface. These quantities were compared to polishing with ethanolic slurries of 0.04 micron precipitated chalk and 0.05 micron gamma alumina, according to conservation practice. X-ray photoelectric spectroscopy (XPS) depth profiling was used to determine the depth of etching caused by the sodium hydroxide solution into the bulk sterling silver. The extent of ALD oxide film removal by sodium hydroxide and surface topography changes due to ALD coating and removal were investigated using electric force microscopy (EFM), a form of non-contact atomic force microscopy, and atomic force microscopy (AFM). The optical quality, conformality, and corrosion barrier effectiveness of ALD metal oxide films were determined on silver with prior surface-specific conservation treatments, such as polishing abrasives, silver dips, and polishing cloths.

Testing Velvet for a William Merritt Chase Shadowbox Frame

Lauren Ross, Senior Conservation Technician for Paintings and Frames, Baltimore Museum of Art; and Miranda Dunn, Pre-Program Conservation Intern at The Baltimore Museum of Art

Photographs of William Merritt Chase in his studio show us

that the artist displayed some of his paintings in shadowbox frames. Dr. David Park Curry, Senior Curator of American Art at the Baltimore Museum of Art, wants to exhibit Chase's *After the Rain—Venice*, an oil painting on wood panel with an ornate gilded frame, inside a shadowbox frame lined with red velvet and encased behind glass. After aesthetic deliberations and with the desired product in mind we discussed potential problems and tests that could provide us with more information.

The red velvet lining in a small enclosed environment would present the possibility of off-gassing that might damage the painting or the frame. We conducted Oddy tests on six velvet fabric samples to determine the affects of off-gassing: silver, copper, brass and lead coupons placed in contact with the fabric. The results of these tests were inconclusive: control metals showed some change, and the different metal types showed different degrees of change for each selected fabric. Because of these varied results, we agreed that further tests should be conducted using the one fabric sample that could be washed without damaging its pile. Luckily, this fabric was the favorite choice of the Curator. X-ray fluorescence spectroscopy (XRF) was used to determine prevalent elements in the painting and in the frame. In further Oddy tests, these elements were kept in mind. Any changes seen in the metal coupons were particularly important with relation to the prevalent elements.

In order to remove any fire-retardants or other chemicals that may have been applied to the fabric during production, we devised eight different washing preparations and then conducted another round of Oddy tests to determine the most effective method. Preparations involved various detergents, water temperatures, and solvents. The results from the second series of Oddy tests showed similar changes to the control group metals as well as those exposed to the fabric samples. As the environment of the Oddy testing jars could not be controlled, it was not possible to determine a fabric preparation suitable for permanent exposure with the painting and frame. However, one wash showed better results than the others. This specific preparation of the fabric could be used if exposure and contact could be limited. The shadow box frame that will be constructed for the painting will create an environment that will reduce the possible off-gassing effects and will maintain the Curator's desired visual presentation. Openings and perforations within the construction of the surrounding frame will provide air exchange, and a scavenger will be placed within the package to detect and neutralize any harmful gases.

The Albright-Knox Art Gallery: Managing Media in the Archive and the Collection

Crystal Sanchez, Moving Image Archivist

The archival object and the collection object in a fine art museum are managed differently according to the needs of the organization and the use of the object within the organization. However, media components, because of the dependencies and risks inherent in their formats, have similar conservation and

preservation needs, whether in the archival space or the fine art space. Working towards a greater understanding of the intersection of art conservation strategies with those of media archiving strategies, this project explored the needs of media works in the archive and the permanent collection at The Albright-Knox Art Gallery. Using moving image archiving approaches, both collections were surveyed for risks to their long term needs. Based on the following research this poster will address the types of media archival strategies that are available for the collections of a fine art museum.

The Albright-Knox Art Gallery is a fine art museum in Buffalo, NY that collects modern and contemporary art. The Gallery's research library serves internal and external art research needs and contains an archive with over 600 video items on multiple formats. Inspection, storage, description, and migration strategies were explored, and a small group of videos were migrated to digital format through the Migrating Media project. Migrating Media is a community collaborative video migration project serving non-profit institutions and individuals in Western New York.

In addition, the Albright-Knox Art Gallery currently holds over 6,500 works of art in its collection; fifty of which are artworks with technology dependencies. This media sub-collection contains works with film, video, digital, and computer based components. Installations are both single and multi-channel, and one work is made with custom electronics. Artworks were acquired over many years and have different histories and different levels of attached documentation.

After working with holdings in the Albright-Knox Art Gallery's video archive through the Migrating Media project, the project then turned to assess the permanent collection works through the lens of a moving image archivist. Using the basis of knowledge and skills of a media archivist, this project approached the risks and needs of media art in the collection. Recommendations and reflections showed intersections between media archiving and traditional art conservation, while exposing risks to the conservation of media-based art in the collection.

This poster will demonstrate the life cycle of a work as it exists under museum stewardship; help viewers better plan for the needs of media art during its acquisition, storage, exhibition and loan; and identify common risks to media art in order to begin planning for its preservation. This topic is pertinent to small and mid-sized fine art museums with media artworks in their collection.

The Art_Con<server>: How Conservation Professionals Make Use of Online Resources

By the Emerging Conservation Professionals Network

The Internet has changed how we research, access, and share information in all aspects of our lives. In response, the conservation field has been working toward transferring a large portion of its literature and resources to an online format. AIC's

Emerging Conservation Professionals Network (ECPN) has partnered with groups within AIC and allied organizations to develop an online platform for conservation student research; in doing so we feel it is important to investigate how conservators are using web-based information in their profession. By conducting this research, we hope to understand standard behaviors and attitudes towards online conservation information and consequently help provide a foundation for effective treatment of this knowledge.

In this poster, we intend to explore the different viewpoints surrounding public access to conservation information and its effects on the conservation profession. The creation of the AIC wiki in 2009, for example, gave rise to numerous conversations regarding the degree of access the general public should have to conservation literature and how this may benefit or harm the conservation profession. The content of the poster was generated with support from the AIC Publications Committee and by distributing a survey to AIC members. The survey questions addressed the creation and promotion of conservation content online and the accessibility of conservation literature.

The survey asked whether respondents create online conservation content themselves and/or participate in promoting conservation content through social media. This provides an in-depth picture of the respondents' engagement with the conservation community online. Of particular interest was the respondents' role in crowd-sourced projects like the AIC wiki and Wikipedia. They were asked whether they contribute content to either site, and how they use the content.

The survey also specifically addressed which Internet resources the respondents use, how often they use them, and their level of comfort with them. These resources include search tools, databases, and archives such as those listed above, as well as Google, Google Scholar, WorldCat, AATA, BCIN, JSTOR, and other full-text databases often available to university affiliates. Respondents were asked to rank their usage and this information is compared to the respondents' opinion on how easily accessible these digital conservation resources are and/or ought to be. These responses provide insight into current information-seeking behavior in the conservation field.

In addition to addressing their relationships with professional information sources, respondents were asked to discuss whether they encounter or reference student research online. ECPN is developing an online platform for student research, and this information helps determine how student research is discovered and whether it is used by practicing conservators, providing us with guidance on how to best implement the platform.

Ultimately, the goal of this poster is to capture and analyze conservators' preferences regarding conservation information online as both information creators and consumers, and to make this information available so that these preferences can be used to guide the development of future online conservation content.

The Use of Menthol as a Temporary Consolidant in Art Conservation

Xiangna Han, Ph. D. Candidate, Shanghai Institute of Ceramics, Chinese Academy of Sciences; Xiao Huang, Professor, Shanghai Institute of Ceramics, Chinese Academy of Sciences; and Hongjie Luo, Professor, Shanghai Institute of Ceramics, Chinese Academy of Sciences, and Shanghai University

Temporary consolidation is an important technique widely used in art conservation and archaeological excavation to protect fragile objects during excavation and transportation. Currently, cyclododecane is the most often used temporary consolidant. However, the toxicity of cyclododecane has become a big concern. Cyclododecane has been confirmed to be highly bioaccumulative, and its allowable exposure limits have not yet been determined. There is a strong demand to develop a safer and as effective substitute for cyclododecane.

Menthol has been used in food, cosmetic, and pharmaceutical industries for centuries with a well-established safety profile. By taking advantage of its sublimation at room temperature, this ancient organic compound can also be used as a temporary consolidant in art conservation. The kinetics of menthol sublimation, its residue after volatilization on various matrices, and its penetrability and distribution on simulated terracotta samples, as well as other important properties, were carefully examined in our laboratory.

Laboratory work shows that the sublimation kinetics seem to follow linear trends on non-porous glass slides, but lines are first order exponential decay fits on porous terracotta samples. Hence, the kinetic pattern of menthol largely depends on the nature of the substrates, which should be seriously taken into account in fieldwork. After 70 days of sublimation on nonporous glass slides, no menthol can be found in the dichloromethane extracts of the sample by GC-MS analyses, which shows that menthol can be considered “zero” residue. In our preliminary research we discovered that the best operational temperature for menthol to use is between the ranges of 20°C–40°C. FT-IR microscopy analyses were performed on the cross-section of one menthol-treated terracotta sample, and it was found that the distribution of menthol was denser at the edges and thinner in the center. It indicates that mechanical strength after temporary consolidation is weakest in the center of the sample, so special attention should be paid to the center of the objects during consolidation.

Using menthol as a temporary consolidant, the fragile relics discovered in the Qin Shihuang’s Terracotta Army archaeological excavation site were successfully consolidated and safely transported to the laboratory. The important aesthetical and historical information carried within those relics were well preserved. Detailed laboratory experiments and successful fieldwork clearly show that use of menthol as a temporary consolidation in art conservation is as effective as cyclododecane and can be a nice substitute for it.

Treatment Considerations of the Double-sided, Oversized Painted Textile: A Case Study of the National Treasure, “Flag of the Formosa Republic”

Jen-Jung Ku, Research Assistant and Conservator, National Museum of Literature, Taiwan; and Chou-Chun Lu, Technical Specialist, National Palace Museum, Taiwan

The Flag of the Formosa Republic, known as the “yellow tiger flag” is an extremely significant object, and it is one of the three most important cultural icons and collections in the National Taiwan Museum. This object is a 1909 duplicate of the original flag that was made in 1895 and is a double-sided, oversized painted textile. Due to its unique historical background and technique, we took more cautions in considering proper treatments and suitable materials. For example, there were intense discussions between historians, anthropologists, and conservators about removing repairs, the authenticity, and audience expectations of the flag. The yellow tiger flag, which is constructed from a plain-weave cotton fabric, was lined with starch in the Chinese style. This is believed to have been done in 1979. The backing paper was adhered badly and causing many damages. Since the flag is large (263 cm L × 315 cm W) and was in poor condition, the removal of backing paper and the re-lining treatment became very difficult. During the paper removal treatment, the conservation team was excited to discover a second painted image on the reverse side, which was hidden under the backing paper for over 30 years. However, the double-sided paint layer became quite a challenge for conservation and storage. After treatment, a large box (321.5 cm L x 50 cm W x 58 cm H) was custom made by local substitute materials in Taiwan for storage.

The flag was documented and analyzed by the Cultural Resource Centre in 2003. Then in 2011, a team of conservators conducted a condition survey and material analysis of the textiles, paint layers, threads, and adhesives found in the flag. This team included the National Tainan University of the Arts in Taiwan, the Scientific Research Department of Metropolitan Museum of Art in the US, the Centre for Textile Conservation and Technical Art History in the UK, Labor Drewello & Weißmann in Germany, and the Bayerische Verwaltung der staatlichen Schlösser, Gärten, und Seen in Germany. There were so many people involved in this project that it has set the highest record of conservation resources of a single object in Taiwan. Based on frequent discussions between the team and the museum, we finally give back the original appearance of the flag. The conservation treatment was finished and was presented in a talk and exhibited at National Taiwan Museum in the end of 2012. This paper will discuss the condition assessment, challenges surrounding the treatments, and re-housing of this national treasure.

When Due Diligence isn't Enough: Revisiting the Question of Case Materials

J. Lauffenburger, Assistant Director, Division of Conservation and Technical Research, and the William B. Ziff, Jr. Conservator of Objects, Walters Art Museum

In September 2001, the Walters Art Museum was in the final phase of a major reinstallation of its Islamic, Ancient and Medieval galleries. Newly envisioned floor plans and cases designed to give context to the collections were an important part of the redesign. This included the use of many plush fabrics, an increased number of blocks and risers within cases, and more thoroughly sealed casework. The results were a visual success but years later the impact of those decisions became clear.

The Walters Division of Conservation and Technical research has a history of rigorous testing of case construction materials and decorative fabrics for case use; the approach to this installation was no different. A version of the Oddy test, which includes assessment of both contact and vapor phase interaction with metal coupons, was conducted on all materials proposed within the galleries; only materials that passed were used in the reinstallation. This included Medex as the primary building material, a material that had been successfully used in past installations at the museum.

Nine years later, several condition issues became apparent. Objects on view in the reinstalled galleries displayed efflorescing salts from ceramics, lead corrosion on bronze alloys and voluminous salts on plaster fills. Subsequent testing and observation indicated a major problem with volatile organic acids within the cases. Ongoing work, to retrofit these cases, is supported by the Institute for Museum and Library Services. Several important observations were made during the process that included the inefficacy of the Oddy test used as the singular indicator of potential dangers; the changing nature of commercial propriety materials such as Medex; the contribution of decorative fabrics such as ultra-suede and velvets to volatile organic emissions; and the retention of organic acids by the objects themselves. As a result of this work, new procedures for selection of case materials, and new case materials and design have been incorporated into the working process at the Walters Art Museum.

When Modern Materials Fail: Rehabilitation of a Taxidermy Orangutan from the Buffalo Museum of Science

Fran Ritchie, Conservation Student, Objects Major, Buffalo State College, Art Conservation Department; Jonathan Thornton, Objects Professor, Buffalo State College, Art Conservation Department; and Aaron Shugar, Conservation Scientist, Buffalo State College, Art Conservation Department

Guardians of natural history collections recognize that the deterioration of organic materials is inherent. Splitting hides and fading

feathers are commonplace. However, the field of taxidermy has always been one of experimentation with materials in the quest for achieving realistic mounts. Although the field has come a long way in preserving animals, collections may contain some of the less successful techniques. An improperly mounted juvenile orangutan from 1966 was damaged when removed from display because of modern materials added to traditional taxidermy materials.

XRF and X-radiography proved the specimen did not contain heavy metal pesticides. The taxidermist replaced the palms of the hands and pads of the feet with latex rubber (confirmed by ATR-FTIR) and nailed the specimen onto a heavy piece of driftwood. Deterioration of the rubber was extensive, comprising both sticky and brittle/cracking regions typical of latex degradation. The considerably damaged hands could no longer support the weight of the specimen and were ripping away from the driftwood.

The conservation treatment required lining the latex rubber with Japanese tissue and BEVA film to reattach fingers and repair splits. Metal rods were inserted into the hands and feet for additional internal supports. Once the specimen was stabilized and repaired, it was attached to a newly fabricated display support mount using current taxidermy methods. Aesthetic compensations were made to create a visually integrated appearance. Ethical dilemmas were present throughout treatment because of the inherent degradation of original material and the need for a new internal support using contemporary taxidermy techniques. The conservation treatment allows the Buffalo Museum of Science to display the orangutan, which is the only one of this endangered species that they own.

XRF study of Mexican Iron Gall Inks: An Historical and Geographical Overview of Their Chemistry

Jocelyn Alcantara-Garcia, Andrew W. Mellon Fellow, Heritage Science for Conservation Program, Johns Hopkins University

The study of iron gall inks has focused mainly on the degradation processes in which iron is involved. Therefore, the development of conservation and restoration methods for iron-gall inked papers has also centered on the role of iron; although other metals may be present (i.e. copper, zinc, magnesium, etc.) The most widely used conservation treatment for iron gall ink-on-paper involves inhibition of iron (II)-catalyzed reactions by forming the corresponding phytate complexes. However, the calcium phytate treatment is often not suitable for inks with high copper content because copper yields to competitive reactions with iron.

The few previous studies on Mexican ink-corroded manuscripts determined that many inks used during colonial period possess high contents of copper. However, many paper conservation labs are not equipped with the proper instrumentation

to determine the content of copper. Therefore, it is necessary both to develop treatment protocols for manuscripts with high copper content and to establish guidelines for when such treatments are necessary. Ongoing research to address the former issue includes the study of pyranose-based compounds currently being conducted at Heritage Science for Conservation (Sheridan Libraries, Johns Hopkins University).

This poster addresses the latter question. Approximately 3000 XRF measurements of iron gall inks were collected from documents that are stored at National Archive in Mexico. The novel portable X-Ray system SANDRA permitted detection

of characteristic elements present in all iron gall inks (e.g. Ca, Fe, S, etc.) as well as characteristic traces and impurities (e.g. Cu, Ni, Zn, Pb, etc.). The documents in the data set originated from all over Mexico and dated from the 16th to 19th centuries. After taking iron content as a reference and extensive statistical processing, several trends were found in documents with a common geographic and chronological origin. This study helps the development of more-focused conservation treatments for iron-based inks on paper, and allows conservators to gain further insight into the history of these inks and their usage in Mexico.

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