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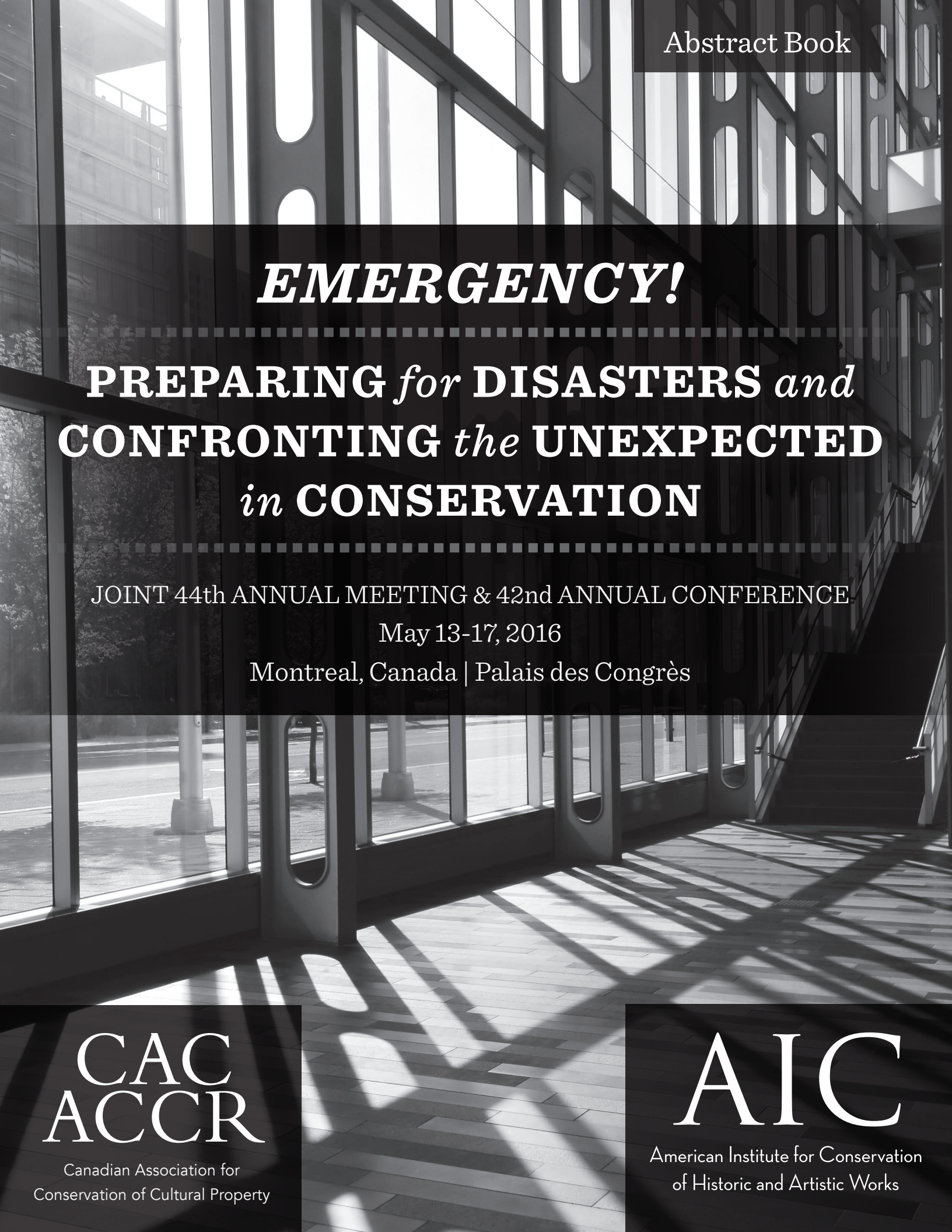

Abstract Book

EMERGENCY!

PREPARING *for* DISASTERS *and* CONFRONTING *the* UNEXPECTED *in* CONSERVATION

JOINT 44th ANNUAL MEETING & 42nd ANNUAL CONFERENCE

May 13-17, 2016

Montreal, Canada | Palais des Congrès

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

The Canadian Association for Conservation of Cultural Property (CAC) is a not-for-profit organization which furthers the dissemination of knowledge concerning the conservation of Canada's cultural property and heritage. We provide opportunities for networking, professional development, and information dissemination for practitioners, individuals, and institutional collectors.

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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Emergency! Preparing for Disasters and Confronting the Unexpected in Conservation

May 13–17, 2016, Palais des Congrès, Montreal, Quebec, Canada

Presentations at this meeting will address in a broad-based way the impact of past, present, and future disasters on the protection of cultural property, as well as confronting the unexpected in conservation (whether it occurs during the treatment of an artifact or during a natural disaster). The scope of the theme includes immediate reactions, such as the application of crowd-mapping technology to aid response efforts, as well as longer term developments stemming from disasters, such as the adoption of simple strategies: Fail to Plan – Plan to Fail, effective risk assessment methodologies, the rapid transformation of damaged artifacts into objects of veneration, and the repercussions of instantaneous visibility of destruction.

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Pre-Conference Discussion Sessions

Choosing and Implementing an Automatic Fire Suppression System for a Collecting Institution

Nick Artim, Principal, Heritage Protection Group; Israël Dubé-Marquis, Head of Building Services, Canadian Centre for Architecture; Carolyn Morgan, Conservator, Bruce Peel Special Collections & Archives; Karen Potje, Head, Conservation, Centre Canadien d'Architecture; Ala Rekrut, Manager, Preservation Services, Archives of Manitoba; John Ward, Preservation Development Advisor, Canadian Conservation Institute

Automatic sprinkler systems have long been an important element in the preservation tool kit of collecting institutions, yet the threat of accidental discharge has also made them a great source of anxiety and, on rare occasions, of water damage. Halon, once seen as an ideal replacement for sprinklers, is no longer an option due to its environmental effects, and there is no easy drop-in gaseous replacement. Water mist and Vortex, a nitrogen/water hybrid system, offer hope of very low-wetting fire suppression. In this panel presentation we will discuss what makes mist and nitrogen/water hybrid systems so promising and why so few museums, libraries and archives in North America have implemented them.

Is this due to lack of precedent? Confusion and conflicting information about the efficacy of these systems in the context of collecting institutions? The difficulty of proving their effectiveness to insurers and regulatory bodies? Cost? Can we do anything, as museum professionals, to put water mist and the nitrogen/water hybrid more easily within our reach as tools to suppress fire in museums, libraries and archives? Panel members will include two conservators and a museum building engineer who have each pitched, successfully or unsuccessfully, for low-water fire suppression systems at their institutions, as well as an expert from the Canadian Conservation Institute, and a fire protection engineer.

Government Funding for Conservation Research and Treatment Panel

The American Institute for Conservation and the National Center for Preservation Technology and Training are hosting a panel on government funding for conservation research and treatment. The goal of this six-person panel is to encourage creative research and treatment projects within conservation and to connect the potential grant recipient to the right governmental grant program. The panel will include three Canadian and three United States giving programs. The group will provide the audience with a brief overview of their grants programs and provide examples of past successful grants. Additionally there will be plenty of time for questions and answers as well as one on one time with potential applicants.

The format of the panel will be a seven-minute presentation from each program. After the opening hour-long presentation, the floor will be open to questions and answers.

STASH Flash III

Rachael Perkins Arenstein, Conservator, Bible Lands Museum Jerusalem, and partner, A.M. Art Conservation, LLC; Shelly Uhlir, Exhibits Specialist, Mountmaker, National Museum of the American Indian

Devising storage solutions that mitigate damage to collections from both threats small and expected, and large and catastrophic is a core task for preservation professionals. Doing so in a way that makes use of an institution's human, financial and material resources makes this task an even bigger challenge.

To help meet this challenge FAIC, with funding from the Samuel H. Kress Foundation, created STASH (Storage Techniques for Art, Science and History collections) www.stashc.com, a web-based resource to share well-designed storage solutions. The site contains the original entries from the printed text, Storage of Natural History Collections: Ideas and Practical Solutions, originally published by the Society for the Preservation of Natural History Collections (SPNHC), and, since the site's launch in 2014, new submissions on innovative and creative storage solutions including projects that were presented at the 2014 and 2015 STASH Flash sessions as part of AIC's annual meetings. The website project is interdisciplinary and the site's editorial board is composed of representatives from a range of allied organizations

As in the previous two years, the 2016 session will utilize a lightening round or "Tips" session format, as well as guided, audience participatory discussion. The selections will be presented in a format that closely aligns with web site entries, allowing presentations to be easily reformatted for online submission after the conference. Presentations will be followed by small group discussions where individuals from different specialties have the opportunity to talk about the modifications, materials choice as well as other creative ways to carry out these projects. In 2016 two themes are proposed for the call for submissions:

- Building on the conference theme, presentations will be solicited on storage mounts that were either specifically designed to mitigate against the threat of a disaster or inappropriate environment, or presentations that assess how rehousing solutions performed in protecting (or not protecting) collections in a disaster or emergency event.
- Building on a topic that came out of the 2015 STASH Flash discussion session and the TSG Tips session, the second proposed theme focuses on multi-function mounts; supports that serve storage, travel or exhibition purposes.
- Innovative storage solutions for individual or collection groups that do not conform to either theme may be accepted if space allows.

General Opening Session

Emergency Management Since the Florence Flood – The Crooked Timber of Progress

Andrew Robb, Head, Special Format Conservation Section and Coordinator, Preservation Emergency Response Team, Library of Congress

The state of preparedness, response, recovery, and mitigation resources related to the emergency management of cultural materials has improved significantly since the Florence Flood of 1966. There have been many noteworthy accomplishments over the past fifty years. Our body of knowledge concerning emergency salvage techniques, especially in the area of freezing and freeze drying, has vastly improved the likelihood of successful recovery for many types of materials, even in large disasters. Emergency preparedness activities have greatly increased in many cultural institutions, especially medium to large ones. In the United States emergency plans at the national level now include cultural resources and a variety of organizational structures such as the Heritage Emergency National Task Force, the National Heritage Responders (formerly AIC-CERT), the Alliance for Response, and WESTPAS now exist to harness the experience and knowledge we have fifty years after Florence.

However, despite these many accomplishments, our capacity to respond is small and can be overwhelmed by the scale of an incident, especially in regional disasters. Bluntly put, we lack significant funds that are immediately available to respond to emergencies so we can help those in need of conservation assistance. The presentation will compare and contrast recent disasters involving cultural resources, such as the Katrina and Rita hurricanes of 2005, the earthquakes in Haiti and Japan of 2010 and 2011, Superstorm Sandy of 2012, as well as the recent 2015 INION fire in Moscow, with the Florence Flood to better understand the current state of collection emergency management and to discuss ways to improve our ability to respond to, and recover from, disasters that harm cultural materials.

Visions of Disaster: Bringing the blur into focus

Polly Christie, Recovery Project Lead, GSA Archives & Collections, Glasgow School of Art; Sarah MacKinnon, Project Manager: Mackintosh Restoration, Glasgow School of Art

The Mackintosh Building at Glasgow School of Art, designed and built from 1896-1909, is widely considered to be Charles Rennie Mackintosh's Masterpiece, and one of the finest examples of Art Nouveau in the world. The building was voted the best building of the last 175 years by the RIBA (Royal Institute of British Architects) in 2009 and is widely recognised as one of the 20th century's most important buildings as a prescient of the modern architectural style. However, on 24th May 2014, a devastating fire broke out. At the time of the fire, the building housed students from across the School, GSA Archives & Collections, and the Mackintosh Library. The fire and water severely damaged the building, its original fixtures and fittings, and the Archives & Collections. The iconic Mackintosh Library was destroyed along with the book collections it contained. Just as Charles Rennie Mackintosh was often described as a "visionary," this paper will use vision and sight as a metaphor through which to present GSA's story. The paper will look at how the school responded to the emergency initially, and how the visibility of the School to national and international audiences, instantly, both helped and hindered progress. It will then look at the approach taken in the building's restoration and the collection's recovery projects. In particular it will explore how preconceived boundaries were blurred – between the building and the collection; between the artefacts and the infrastructure within which they sit; between the original and the authentic; between preservation and 'future-proofing', repair and renewal; between what has value and what incurs cost; between old and new; past and future. We will discuss how, while all the differing elements affected by the fire needed to be assessed individually, their interdependencies and overlaps demanded an holistic vision and integral approach to restoration, reconstruction and conservation, from both a strategic and logistical perspective. Ultimately the restoration must ensure that the building is equipped to fully function as a living, breathing art school, as it always has, whilst recognising and preserving its cultural significance. We will look at how the architects, librarians, archivists, curators, contractors, conservators and managers worked together to bridge the gaps, focus the blurs and re-imagine, re-construct and re-organise the school's assets. The paper will illustrate the complexities of the tasks, by looking at the approaches taken in a number of contexts – for example, how assessing the water-damaged textiles was necessarily done blind; how the conservation of the fire damaged plaster casts were governed by the building restoration; how re-building the library raised questions and insights on the nature of authenticity, and thence the tension between the authentic and the functional; how negotiating with insurers prompted a review of GSA's heritage. The team from GSA will share strategies, experiences and learning from the disaster, and will ponder the benefits of re-envisioning GSA's cultural assets in preparation for potential future, unforeseen disasters.

When Disaster Mitigation is a Priority: Evidence from risk analysis of rare events

Irene Karsten, Preservation Development Advisor, Canadian Conservation Institute; Stefan Michalski, Senior Conservation Scientist, Canadian Conservation Institute

Since resources are always limited, disaster risks, which are by nature rare events, may not get enough attention until the disaster occurs. Recent comprehensive risk assessment projects

conducted by the Canadian Conservation Institute have shed light on the magnitude of risks such as fire, water leaks, floods and tornado relative to loss of value due to other agents. In this paper we present the results of generalized risk analyses that clarify not simply the common-sense notion that different places have different disaster risks, but that under certain conditions these may become priority risks relative to all the other risks facing the collection. Risk analysis in these situations relies on incidence and severity data that may be organized geographically, or by type of building, or often both. Analysis also depends on models developed by experts that relate the presence or absence of various features and behaviours (levels of control) in a building with the degree of damage to the contents. Specific examples we will describe include the following. Flood risk becomes a priority if collections are stored below grade in locations at high risk of overland flooding once in 1000 years or more frequently. Physical damage due to storms becomes a priority risk in many building types in regions at risk of Category 3-5 hurricanes and EF4-5 tornadoes even when the chance of a direct hit is small. Earthquakes become priority risks in non-seismically stable buildings in regions experiencing earthquakes categorized as zone 4 in the Munich Re world map. Fire risk is high for collections even in fire resistive buildings unless fire suppression is present throughout and there is on-site security presence 24 hours daily. When risks are high, mitigation is highly recommended. Reducing the risk due to rare and potentially disastrous events has three stages: reducing the likelihood of the hazard in the first place (preferable, if possible), reducing the exposure of susceptible collections during the event, and preparing an effective response and recovery that one can implement after the event. Cost-benefit analysis demonstrates the effectiveness of even high cost facility upgrades, even though museums may consider disaster risks as "too rare" to warrant action. For hazards where avoidance and blocking are not feasible, cost-benefit analysis of respond and recover options can also show the effectiveness of preparing for the unexpected.

Preserving Trauma: Treatment Challenges at the 9/11 Memorial Museum

John D. Childs, Principal, Childs Conservation Consulting, LLC; Maureen Merrigan, Assistant Conservator, National September 11 Memorial and Museum

History museums, especially memorial museums, present particular challenges to the conservator because the condition of an object can play a paramount role in its interpretation. Many of the objects in the 9/11 Memorial Museum's collection are severely damaged, having suffered physical trauma on the day of the attacks. It is this visible destruction which so powerfully allows the museum to tell the story of the attacks and their aftermath. The conservators' role at the 9/11 Museum is to preserve this damage, allowing the objects to tell their stories to future generations. This presentation will discuss three items in the collection which exemplify the challenges faced by the museum's conservators.

When Hurricane Sandy struck Manhattan in 2012, the 9/11 Memorial Museum, which is mostly below grade, was not yet complete. The storm surge flooded much of lower Manhattan, including the Museum site. Several collections objects were already on-site, their size dictating that the museum be built around them. These large objects were submerged by the flood, including a section of wall from the World Trade Center parking garage level that was struck by the 1993 truck bomb. A "B2" mark on the wall was covered in soot after 9/11 when the pile at Ground Zero burned for months. When recovery workers reached the garage level, this wall section was saved. During Sandy, the object was protected by a wood framework covered in plastic. The floodwaters penetrated the plastic and left behind a layer of silt on the sooty surface of the slab. Conservators had to remove the silt, while leaving the soot intact.

At the concourse level of the World Trade Center there was a shopping mall which included a Warner Brothers store. During the recovery, workers discovered the remnants of a "That's All Folks" sign, still attached to a portion of the wall. They removed this remnant in pieces, including portions of the concrete tile backing. The exhibition plan called for this remnant to be installed as it appeared when discovered. This required that the parts be reassembled in such a way as to not obscure the damage. This treatment required careful interpretation and close consultation with curatorial staff.

When the towers collapsed, Chelsea Jeans, a clothing store nearby, was inundated with the dust that was ubiquitous across lower Manhattan that day. The owner of the store, rather than clean up the dust, erected a glass wall in front of a portion of his store, preserving it as a stark memorial to the events of 9/11. When the store went out of business a year later, the owner gave the contents of this "case" to the New-York Historical Society, which removed and crated the contents using asbestos-handling techniques. The NYHS has given the Chelsea Jeans store display to the 9/11 Museum, and the museum has put the display on exhibit, still coated in 9/11 dust. The toxic nature of the dust required special preparation, handling and case design in order to exhibit this material.

Luncheon Sessions

Strategic Management of Collection Storage to Serve an Institution and Society

Moderators: Lisa Elkin, American Museum of Natural History and Christopher Norris, Peabody Museum, Yale University

Collections are not simply to have and to hold. The point of keeping collections is to enable an institution to fulfill its mission and, more broadly, to serve the continuance and betterment of society as a whole. Speakers will provide varying perspectives.

Democratizing the Museum/Respectful and Responsible Stewardship

Speakers: Sanchita Balachandran, Johns Hopkins University and Kelly McHugh, National Museum of the American Indian

The speaker(s) will discuss the practical work of democratizing collections care. All collections demand a deep and sustained engagement with non-museum stakeholders who have claims to both the tangible and intangible aspects of museum objects. The ultimate aim of preservation is to restore the social and cultural relevance of collections, thus transforming and revitalizing not only collections, but also collecting institutions, stakeholders, and staff.

Partnerships in Collection Care

Speaker: Christopher Norris, Peabody Museum, Yale University

The speaker will discuss the importance of collection care professionals working closely with allied professionals to preserve collections more effectively and make them ever more broadly accessible. These allied professionals include both staff within the institution and consultants bringing special skills and knowledge. Dynamically forming teams with members ranging from maintenance staff to directors of foundations will greatly enhance the power of collection care professionals to benefit their institution and society as a whole.

Risk Management and Preventive Conservation

Speaker: Robert Waller, Protect Heritage Corp.

The speaker will describe preventive conservation as a system and as a sub-system within larger institutional and societal systems further supporting concepts covered in the previous talks. A risk assessment and management approach will be introduced. That approach provides a rational framework for ensuring that resources for preventive conservation are as effective deployed as possible for retaining values of the collection to the institution and to society. That is accomplished by ensuring that, even from multiple perspectives of hazards, collection units, locations, values, and so on, there are no egregious risks affecting collections.

These presentations are born from content developed for the upcoming book, *Preventive Conservation: Collection Storage,* an AIC, SPNHC, SI and GWU partnership publication (expected publication date, October 2016). All talks will use examples from subsequent chapters in the book to illustrate points.

Socratic Dialogue: The Best Laid Disaster Plans of Mice and Men Often Go Awry - Now What?

W. (Bill) Wei, Senior Conservation Scientist, Rijksdienst voor het Cultureel Erfgoed

In the past two decades, conservators, collections managers, and other museum professionals have benefited from increasing experience with risk analysis and disaster planning methodologies. With proper training and practice, many more valuable objects and collections of cultural heritage have been saved than ever before. The 2016 AIC annual meeting provides an ideal opportunity to share and review this experience in disaster planning and management, review the success and failures in practice, and discuss how approaches to disasters and the unexpected can be further improved.

However, disasters by definition, don't follow plans. What should we do when confronted with the unexpected? We won't know until we are actually confronted with the situation. This conference is thus also providing an opportunity to pause and take some time to reflect about what it is we want to achieve in disaster planning and management, and why. With that in the back of our minds, we can perhaps better cope with the unexpected when it does happen.

In the continuing series of so-called Socratic dialogues at AIC annual meetings, a Socratic dialogue will be conducted to help us investigate our thoughts on these questions on disaster planning. A Socratic dialogue is a structured form of dialogue in which all participants actively contribute. The purpose of the dialogue is not to solve the question at hand, that is, specifically determine how we should react in an emergency and what to do when the unexpected occurs, but to investigate each other's experience, and concerns about how to handle unexpected situations, concerns such as:

- Disasters don't always follow disaster plans. What do you save if you only have a few seconds or minutes, and why?
- How much damage is acceptable in order to save as much of a collection as possible?
- Do we let bystanders or volunteers help save and initially stabilize (large numbers of) objects if the professionals can't get there on time?

The Socratic method provides a safe, open environment for participants to investigate what the essence behind these issues is, and to understand their own points of view as well as those of others. In practice, it provides a better foundation for that moment when the best laid disaster plan goes awry, and one then has to make split second, gut decisions about what to do.

Heritage Health Information

Join us in a lunchtime discussion of recent developments in IMLS's continuing support of collections care and conservation. We'll share the results of "Heritage Health Information 2014: A National Collections Care Survey" and what they tell us about the condition and preservation needs of the nation's collections. Then we'll discuss the launch of a new national conservation assessment program for collections care in small and medium-sized museums. And last but not least, we'll highlight some of the findings, models, tools, and other resources recently developed by IMLS-funded Collections Stewardship projects.

Protect Yourself - Save your Collections: Health and Safety in Emergency Response

Pierre Barbarie, Director, Campus Public Safety, McGill University; Barbara Lawson, Curator of World Cultures, Redpath Museum, McGill University; Vicki Lee, Director of Conservation and Preservation, Maryland State Archives; Julie Sobelman, Consulting Industrial Hygienist, CIH, CSP, LEED AP

Do you and your colleagues have the necessary rapid-response plans, training and supplies to address disasters safely? Focusing on health and safety issues in emergency response, this session will discuss practical approaches and lessons learned by conservators, safety and emergency professionals from real disaster scenarios. Presenters from McGill University's Emergency Management & Preparedness Office and Redpath Museum will discuss institution-wide implementation of preparation and response, focusing on the health and safety needs of first responders and how the wider University incident plan is coordinated with the Museum. Representatives of the National Heritage Responders (Formerly AIC-CERT) will discuss health and safety issues related to conservators acting as second responders.

Specific health and safety topics will include creating go-kits and the personal safety supplies needed first during an emergency; deterioration of emergency supplies; steps in the re-entry and understanding site safety; environmental concerns, including water and particulate hazards and mental health issues of victims and those responding to the emergency.

Five Tracks

Track A: Confronting the Unexpected)
Track B: Get Ready, Get Set - Emergency Preparedness
Track C: GO - Emergency Response
Track D: Hearing from a Group - Two Panels on Collaborative Efforts Following Recent Disasters
Track E: Lead by Example - Models to Follow

Confronting the Unexpected—Track A

The Uses of Oral History in Documenting Disasters: A Case Study of the Florence Flood

Rebecca Anne Rushfield, Consultant, (in private practice); Joyce Hill Stoner, Edward F. and Elizabeth Goodman Rosenberg Professor of Material Culture; Director, Preservation Studies Doctoral Program; and Paintings Conservator, Winterthur/UD Program in Art Conservation, University of Delaware

The Florence Flood of November 1996 was a seminal event in the development of the field of conservation and the careers of those students and conservators who went to Florence in response to the disaster. Thus, the topic of the Florence Flood has come up in the course of many an oral history interview conducted under the auspices of the FAIC Oral History of Conservation Program.

In order to approach the topic more systematically, the authors took advantage of the November 2006 symposium marking the 40th anniversary of the Flood, held at Villa la Pietra in Florence, to organize a series of interviews with people who responded to the call for assistance. The fourteen interviewees answered questions about how and when they became involved in the rescue efforts and what materials and methods they had to work with. These interviews capture many stories about how the respondents confronted the disaster and coped with adversity. Oral history interviews record the observations and knowledge born of experience that do not find their way into the articles published in professional peer-reviewed journals. Oral history interviews add a human dimension to disasters. They may be biased and the material they contain may not be politically correct. However, they bring into the public discourse myths and rumors about treatment decisions and the efficacy of materials and methods, allowing them to be discussed and re-examined. In this presentation, the authors will use material from interviews in the FAIC Oral History Archive to show how first responders and later arriving students and conservators confronted the unexpected during the aftermath of the Florence Flood. They will also present the cohort of Florence Flood interviews as a case study on the uses of oral history in documenting disasters.

Race, Diversity and Politics in Conservation: Our 21st Century Crisis

Sanchita Balachandran, Curator/Conservator, The Johns Hopkins Archaeological Museum

In 2015, after the hate crime that left nine African Americans dead in Charleston, South Carolina, and following a series of police killings of unarmed African Americans, several monuments depicting Confederate leaders were spray-painted with the phrase "Black Lives Matter." Media outlets circulated photographs of black and red writing scrawled over white stone monuments, and then captured images of these words being removed, sometimes leaving ghosts of the phrases behind. As the meaning of enacting rage against symbols of a problematic past was widely debated in the media, the conservation profession remained publicly silent. Discussions on AIC's email lists evidenced a concern for effacing paint rather than pausing to consider why this particular cultural heritage had been targeted, or wondering what it might mean to leave the words in place and engage in a community dialogue about how to interpret and manage monuments of complicated and hurtful histories.

Since the professionalization of the conservation field in the twentieth century, we have grown more proficient at understanding and caring for the physical aspects of our collections. But this emphasis on materials rather than materiality—how objects and their materials create meaning and value—has led the conservation profession away from its core function. This paper asserts that the core of our work is to care for the histories, memories and stories embedded in objects. This "intangible" heritage is as essential to preserve as "tangible" heritage. Our work should be to preserve the possibility that objects' multiple values can continue to be accessed and used by the people for whom this heritage has meaning. Contemporary conservation falls short of this essential function, a failure stemming from the profession's lack of diversity, detachment from ongoing social and political dialogues, and limited engagement with the diverse communities whose heritage we are entrusted to preserve.

The 2015 "Art Museum Staff Demographic Survey" by the Andrew W. Mellon Foundation, the Association of Art Museum Directors and the American Alliance of Museums brought the lack of diversity in the museum field into sharp focus. As cultural institutions struggle to remain relevant and reach out to broader audiences, the conservation profession seems to be in a phase of retrenchment, more carefully policing our professional qualifications rather than looking outward and asking, whose voices are we missing in the conservation process? Without including more diverse voices within the conservation field, and engaging with a wider group of stakeholders outside our field, we risk erasing histories and stories that are in our care. Conservators must move beyond the mere physical care of collections. The social and political crises of our contemporary world demand more than technical solutions; they require our dedicated engagement with the problems of our time. They require a commitment to growing more inclusive in how cultural heritage is preserved and

by whom, and to be more attuned to the deeply emotional aspects of the collections we steward. Conservation in the twenty-first century can no longer just be about objects. Conservation has to be about people as well.

Preservation of the Detroit Institute of Arts (DIA) Collection: Protecting Art at Risk

Barbara Heller, Director and Conservator, Special Projects, Detroit Institute of Arts

I thought I was well versed in preparing for disasters and confronting the unexpected in conservation. I treated water-damaged books and panel paintings after the 1966 flood in Florence, Italy; had disaster mitigation training; had responded to emergency situations at the museum as part of the DIA's emergency team; and conducted disaster preparedness workshops for other cultural organizations. As chief conservator, I successfully developed special dust mitigation strategies to protect the building and collection during the museum's 6-year $158.2 million multi-phased Master Plan Capital Improvements and Building Program.

All my cultural property protection experience was called upon after the governor of Michigan appointed an emergency manager(EM) for the City of Detroit on March 14, 2013. The City filed for bankruptcy on July 18, 2013, the largest municipality in the US to enter Chapter 9. Municipally owned, the DIA was being operated by the Founders Society, a not-for-profit 501(c)(3), through a 1997 Operating Agreement with the City. The art became at risk on September 8, 2013, when the EM asked for the portion of the collection purchased by the City to be evaluated. Creditors asked the judge to take steps to sell the museum's treasures. The DIA responded that it holds the collection in trust for the public and is not subject to sale in order to pay the City's bills. The Detroit Museum of Art was founded in 1885, but the collection was donated to the City by the Founders Society in 1919, when the City agreed to build a new museum in the newly established cultural district. This gift is etched on the marble façade: "Dedicated to the People of Detroit to the Knowledge and Enjoyment of Art." Public funds were appropriated for operations and the purchase of artwork. The majority of the City purchases were made in the 1920s and 30s, and included some of its most iconic works.

I was asked by the director to conduct research on the collection not only for the evaluators, but for our lawyers to help defend the collection. I cannot reiterate the importance of access to files such as registration, donor/dealer, curatorial, conservation reports, archives, etc. For example, while reading the original minutes from the archives, I found discrepancies regarding ownership that were not reflected in the collections database. The City would purchase an artwork and then some time later, the Founders Society or another patron would repay the City that amount so they could become the donor. To protect our collection, Curatorial staff accompanied Christie's at all times and Collections management set up a room for examination to limit their access to collections storage. The presentation will discuss the internal processes that were created; the importance of conserving, digitizing records, and making them searchable; and how the Grand Bargain, the agreement to fund pensions and prevent the sale of the DIA artwork was achieved. As of 2015, the DIA is a nonprofit corporation aka Founders Society Detroit Institute of Arts. The collection was saved and is no longer at risk.

Get SMART! Setting clear expectations for preservation

Robert Waller, President and Senior Risk Analyst, Protect Heritage

The 2016 meeting theme includes mention of "effective risk assessment methodologies" as a long-term response to the need for better emergency preparedness. It also encourages exploration of "surprises encountered along the way in any treatment." Treatment, in the preventive conservation context, is the treatment of risks to collections to reduce their likelihood, their impact, or both. These two ideas are not disparate but are linked. The strongest link being through the comprehensiveness and clarity of our risk assessments. An effective risk assessment methodology must not only be capable of being comprehensive but must provide evidence of its comprehensiveness.

Just one recent example of our failure to anticipate risks comprehensively was the surprise among the museum community at the 2011 Washington earthquake. This event was "unexpected" despite the fact that just one year before the 2010 international Forum on Understanding Risk, held in Washington, DC, had identified a low perceived earthquake risk in Washington, DC, likely to be a false expectation, a simple result of an anomalous period of low seismic activity over the past 300 years. People, like all organisms, are creatures of habit. As such, we hold to a default of expecting tomorrow to be similar to yesterday and today. This leads to any and all unforeseen changes being surprises, often small or even trivial, but surprises nonetheless.

When we are confronted by too many, too diverse changes our ability to foresee changes and to maintain a balanced view of their significance, let alone to contribute to their management, fails. We rely on other well established professional groups to contribute much, even most, of preservation achieved. Certainly the roof, walls and secure doors provided and maintained by facilities management services provide 90%, or more, of the protection of collections from damage and loss. The coordination of collection risk management poses both a challenge and an opportunity for the conservation profession. We can step in to what is clearly a breach in our wall against deterioration, damage, and loss of heritage. Or not. If we, the conservation profession, do not take up the challenge of assuring comprehensive collection risk management then it is certain that one of our allied professions, be it registration, audit, facilities management, security management, or other, will. All that is required is setting preservation as a SMART goal (Specific, Measurable, Attainable,

Realistic, Time-bound) then taking responsibility for identifying departures from the goal (risks) and ensuring ownership of, and resources for, risk controls are in place. Ultimately it is not critical that this is done by professional conservators but allowing our field to grow in that direction would seem to be in our best interest.

Conserving Culture First: The 2013 Fire at the U'mista Cultural Centre

Beth Boyce, Curator and Education Manager, Museum at Campbell River; George Field, Objects Conservator, Royal British Columbia Museum; Heidi Swierenga, Senior Conservator; Head of the Collections Care, Management and Access Department, Museum of Anthropology at UBC

The U'mista Cultural Centre is a small institution with a big reputation. Located in the small community of Alert Bay on an isolated island off the coast of western British Columbia, the centre was created in 1979, to house the potlatch materials repatriated from Museums across North America. These articles of regalia had been seized from their west coast communities in 1922 after a large potlatch was held in the area. At the time, the Potlatch Ban made these gatherings illegal under Canadian Law and participants were given the difficult choice of either relinquishing their regalia or serving jail time. In the summer of 2013 there was an accidental fire at the Centre in its Potlatch Gallery, where all the repatriated materials are displayed and stored. Almost immediately, conservators from three coastal museums: the Royal British Columbia Museum, the UBC Museum of Anthropology, and the Museum at Campbell River rallied to help support the staff at the Centre and help with the immediate recovery after the fire. This relationship has continued with assisting the Centre to form a long-term recovery plan, and the treatment of the objects over time. In this talk we will discuss the events of the fire and recovery, touching on some of the unexpected challenges faced, the importance of community involvement in the decision making process, and the importance of this collection to its community. The U'mista Cultural Centre is not a museum, and so the choices made about the recovery and treatment of these objects may be surprising to some.

The Challenges of Conservation of Artifacts from Major Disasters: Titanic, Challenger, Columbia and the World Trade Center

Elizabeth Beesley, Conservator & Project Manager, Conservation Solutions, Inc.; Joseph Sembrat, Senior Executive Vice President & Senior Conservator, Conservation Solutions, Inc.; Mark Rabinowitz, Executive Vice President & Senior Conservator, Conservation Solutions, Inc.; Justine Posluszny Bello, Vice President of Operations & Senior Conservator, Conservation Solutions, Inc.

Unfortunately, there are many disasters that result in large-scale loss of life or are significant due to their cultural impact. Objects that result from these are often preserved to honor the dead and to act as a permanent memorial for the event. For conservators, working on these artifacts is complex as they have unique materials-related challenges and emotional and cultural importance. This paper will examine the conservation approaches taken when working with objects that have been involved in significant disasters. CSI has had the privilege of working on several of these including:

- artifacts from the RMS Titanic shipwreck
- pieces from NASA's space shuttles Challenger and Columbia for a memorial at Kennedy Space Center
- an architectural element or 'trident' salvaged from the World Trade Center currently on display at a division of the Federal Bureau of Investigation
- the wreck of a US Army B-26 Marauder bomber aircraft which crashed in the Yukon Territory, Canada, in 1942

Treatment of these objects posed unique and significant challenges. In materials terms, all these artifacts were subjected to catastrophic events that resulted in acute and unusual physical damage. For the artifacts from Titanic, Challenger and the Marauder, this was compounded by the effects of long-term submersion in an ocean or lake. Although a valuable body of research exists on the conservation of sunken aircraft and aluminum from maritime archaeological sites, these specific artifacts had, after salvage, been subjected to further extreme or unusual environments that may not only have contributed to further deterioration. For example, the Marauder remained outside near Whitehorse, YK, which has temperature extremes that range from up to 30C/86F to below -50C/-58F. Limited budgets, the secrecy surrounding some of these projects and the remote or restricted locations where the objects had to be treated made logistics significantly more complex. The security issues of working on an active military base limited treatment options, as the ability to transport materials to the site and monitor ongoing treatments was greatly reduced. As communications were restricted in some cases, the exchange of information with colleagues and subcontractors was very difficult. While these factors complicated the conservation work, they also forced the development of creative solutions to produce successful treatment outcomes. A further important aspect of working with these unusual objects was understanding the nature of their significant emotional and cultural value. Conservation work on objects that are part of such immense and recent national tragedies as the 9/11 terrorist attacks and the Columbia and Challenger disasters involves navigating the complex, varied and changing relationships that stakeholders have with the artifacts. The discovery of the Titanic wreck-site in 1985 was momentous but also engendered significant discussion, controversy and litigation concerning the salvage of its artifacts. Although the conservators were not directly involved in these aspects of the project, it remains important that we acknowledge the cultural, ethical and legal sensitivity of such artifacts as these variables can inform our conservation practice.

Get Ready, Get Set - Emergency Preparedness—Track B

Through Hell or High Water: Disaster Recovery Three Years after Alberta's Floods

Emily Turgeon-Brunet, Lead Conservator, Archives Society of Alberta; Amanda Oliver, Assistant Archivist, Western University Archives

In June 2013, the province of Alberta, Canada experienced severe overland flooding. In response to the flooding, the Archives Society of Alberta (ASA), a not-for-profit professional association, organized the Flood Advisory Programme. This programme is funded by Alberta Culture & Tourism, and is carried out by The Lead Team. The Lead Team visits each of ASA's members to perform a site assessment and determine how they can assist with disaster recovery and salvage work, as well as disaster preparedness. The ASA is comprised of 44 institutional members, varying in size, location, type of institution, number of staff and available funding. Due to the unique situations of each institutional member, customized work plans are required for individualized assistance. Work plans have included hiring contractors to assist sites in need; purchasing rehousing supplies, fire-proof shelving, freezers, disaster recovery kits, and safety supplies; writing disaster plans and editing existing ones; and providing advice on mandates, policies, insurance and facility risks. The hired contractors carry out a number of tasks including appraisal, accessioning, arrangement and description, conservation treatment, rehousing, digitizing, and reconciling damaged material with its original description. The Lead Team has taken a broad interpretation of what is considered disaster preparedness while conducting site assessments. They have found that improperly housed items, versus those that were properly housed, are less likely to be salvaged when affected by flooding. In addition to directly assisting members, they have also created a variety of educational resources found on their webpage (http://archivesalberta.org/programs-and-services/flood-assistance). These resources include how-to videos, informative blog posts and PDFs, staff training scenarios, and downloadable templates. Institutional members that received the most assistance will be highlighted to exemplify how the Lead Team develops and completes their proposed work plans. The Lead Team's two goals are to help affected members recover from the flooding, and to thoroughly prepare all of their members for disasters by providing them with the recommended supplies, tools, training and knowledge.

Clandon Park: Rising from the ashes

Christine Leback Sitwell, Paintings Conservation Adviser, National Trust; Sophie Chessum, Curator/Consultancy Manager, National Trust

Clandon Park Fire: A serious fire started at approximately 4pm on Wednesday 29 April 2015 at the National Trust property, Clandon Park, in Surrey, England. By the next morning the fire was under control but had caused varying levels of damage from surviving rooms to complete devastation. The house contained not only significant collections related to many generations of the Onslow family but also significant loaned items, objects belonging to the Surrey Infantry Museum, an independent museum within the house, and the belongings of a resident staff member. Responding to the disaster not only involved the immediate efforts by Surrey Fire and Rescue Service but also the property team's well-rehearsed salvage plans, supported by National Trust's own specialist advisers and external conservation advisers. In the age of social media, the importance of managing media requests was crucial but also required great sensitivity due to the risk of theft and impact of the potential losses of objects owned by the National Trust, lenders and the Surrey Infantry Museum. The access via wireless connection to the Trust's collections management system enabled the Trust to establish the identity of salvaged objects, report on their condition and organize swift removal from site to safe storage. Due to the high-quality solid brick construction of the building it has survived the fire with only a few compromises to its integrity. However, due to the risk of falling material from high level, a drone was used to photograph the house and a metal cage containing members of the fire brigade and National Trust suspended via a large crane enabled immediate assessment of the structure of the building as well as any surviving objects.

Despite well organised salvage plans, a review of the disaster revealed areas for improvement in the digital management of collections. The remote access to the system proved sporadic due to the large amounts of information transferred over the wireless connection and at times poor connection to the internet. Co-ordination between four sites – the burning building, the salvage areas on both the east and west lawns, the school used as the immediate salvage area and the central office proved challenging in terms of updating information and establishing not only the systematic removal of objects but also developing immediate plans for the salvage of contents, architectural features and fittings within the house. Since the fire, a project team supported by wider internal and external expertise has been developed to focus on the stabilization of the building, the salvage of material from within the house, prioritization of the collection conservation, liaising with stakeholders, press and social media. A significant challenge has been the management of potential contaminants within the building and debris. After the fire, National Trust Director General Dame Helen Ghosh made the statement that [we will] 'rebuild Clandon Park in some shape or form'. During the coming year, the options for the future of Clandon Park will be considered with all the challenges that these might present: significance, authenticity, audience, context, relevance and interpretation.

Cologne Historical Archive Collapse: A critical history of emergency situation and ongoing disaster recovery process

Marion Verborg, Paper Conservator, Historical Archive of the City of Cologne; Bettina Schmidt-Czaia, Head of the Archive, Historical Archive of the City of Cologne; Nadine Thiel, Head Conservator, Historical Archive of the City of Cologne

On March, 3rd 2009, almost the entire building of the Historical Archive of the City of Cologne collapsed into the subway tunnel underneath, causing a great loss of valuable documents and taking two lives. About 30 shelf kilometers of numerous important collections of records lay among sand and rubble, buried at between 12 and 28 meters below street level. This emergency case brought together firemen, archive staff members and volunteer citizens to work hard to salvage these documents. The archive housed 1,000-year-old records, among those about 65,000 charters on paper and parchment, and 2,000 manuscripts. The entirety of these unique historical accounts needs to be identified, re-registered, and conserved immediately for future generations.

The salvaging procedure was successfully completed in August of 2011; an estimated 15% of our objects were slightly damaged, 50% sustained medium damage and 35% were heavily deteriorated. Damages vary from small scratches on paper or parchment to huge holes in entire books. As an ongoing disaster recovery process, we are currently developing and improving conservation measures in a temporary off-site building established after the collapse. A team of more than 50 conservation technicians and 20 worldwide conservators work on these projects, closely with archivists and process analysts. Typical daily tasks include: identification, registration, condition report, dry cleaning, quality control, categorization (depending of possibility of direct or indirect use), digitization, and rehousing. The procedures are still evolving, using feedback from co-workers to improve our system. In our case, the term "conservation" describes a course of action that, considering the need of treating very large amounts of material, does not aim to restore aesthetic appearance, but aims to stabilize documents so that they can go back into use, be it in their original or in digital format. We also use all the opportunities and possibilities that this specific situation offers us, taking advantage of the newest technology as well as the large pool of co-workers.

In addition to conservation challenges we are facing the constraints of the legal framework of a recourse. One of our specific projects is the treatment of the 3,000 meters of archive material salvaged wet. Vacuum freeze drying units were used in varied places in Germany. Once dried, the documents are put through the cleaning process carried out on site. Another project in which every conservator is currently involved is the development of a specific conservation documentation software in collaboration with programmers. The aim is to digitally write our documentation form for each object we treat, in order to have a specific database and no more paper forms. This program will allow us to assess the quantity and quality of damage, to define the needs for damage-related conservation procedures, and to estimate the time we spend on our disaster recovery process. Coordination of all these projects in an "after-disaster" context is challenging, and requires some non-conservation specific skills, communication of which is of primary importance. Every choice must be the result of a balance between budget options, material/time availabilities, and effective management of personnel.

Beyond Response: Christchurch Art Gallery's Recovery from the Canterbury Earthquakes

Gina Irish, Registrar, Christchurch Art Gallery

Beyond Response explores the aftermath of the Canterbury earthquakes (2010-2011) referencing the Christchurch Art Gallery's immediate response to a series of devastating events, and the obstacles an organisation might face when recovering from a citywide disaster. While the content of this paper makes specific reference to seismic risk, parallels can be drawn between this disaster and others. Almost immediately and for several months following a particularly crippling earthquake that claimed lives, homes and entire suburbs, the Gallery found itself within a cordon and the base for the Government led emergency response team who occupied exhibition spaces and all back of house areas, excluding storage. Access on the premise that exhibitions needed to be deinstalled was extended to allow the assessment and in some cases the salvage of broken and wet works both in storage and on display, including the stabilisation of works in response to ongoing aftershocks.

The knock-on effects of the main event soon became clear when months later a neighbouring fourteen storey apartment block was subject to an urgent demolition notice ordered by authorities, resulting in the emergency relocation of the entire collection from all storage areas to an area within the building away from the apartment's fall zone. Logistically challenging, the collection comprising of over 6500 works was safely relocated without incident, in a matter of weeks. As months passed and liquefied land settled, it became apparent that the Gallery had suffered significant damage resulting in a complex repair at considerable expense for insurers who contested aspects of the claim, thus delaying remediation works. In 2013 repairs commenced, starting with the relevelling of the Gallery, followed by retrospective base isolation, the repair of thousands of glass panes that form the façade, plus repairs to all internal works, including mechanical and electrical systems. With no alternative site available and despite risks arising from construction, the collection has remained onsite at all times.

Reflecting on the realities associated with response and recovery, the disaster plan was refined to include realistic response guidelines. A priority list was compiled using an effective assessment methodology, the contents of disaster bins were rethought, relationships between the Gallery and emergency services were established, facility handbooks were written and communication

plans were clearly articulated and tested. Short-term response plans were expanded to include long-term business viability strategies. In the face of adversity, the Gallery displayed resilience and determination: pop-up exhibition spaces were established, significant works were acquired through new funding models, funds were secured to complete betterment works to the facility, and well over 90% of the collection is now accessible online. Almost five years on and transitional plans are replaced by a sense of permanence, ending a lengthy period of uncertainty. Due to reopen in 2016, the Gallery will find itself operating in a new city where recovery is slow and seldom straightforward. Beyond Response charts this journey, detailing how the Gallery responded to and more often than not, successfully managed the unexpected.

The Royal Palace and Square of Patan, Nepal and the Earthquake 2015: Immediate actions and midterm planning

Gabriela Krist, Head of Institute, Institute of Conservation; University of Applied Arts Vienna; Martina Haselberger, Project coordinator, Institute of Conservation; University of Applied Arts Vienna; Marija Milchin, University Assistant, Institute of Conservation; University of Applied Arts Vienna; Kathrin Schmidt, University Assistant, Institute of Conservation; University of Applied Arts Vienna; Manfred Trummer, Head of Conservation Department, Austrian Museum of Applied Arts / Contemporary Arts

The earthquake of 25th April 2015, known as the Gorkha earthquake, and the subsequent one of 12th May which struck Kathmandu Valley, caused a big humanitarian catastrophe and enormous damage to Nepal's cultural heritage. Thousands of people died and were injured, more were rendered homeless. Additionally, monuments and sites in the valley were affected and severely damaged. All seven monument zones which make up the Kathmandu Valley UNESCO World Heritage Property suffered extensive loss and destruction. The stupas of Swayambhunath and Boudhanath partly collapsed. The three Durbar Squares of the royal cities Kathmandu, Patan and Bhaktapur suffered massively with buildings totally destroyed or heavily damaged. The immediate response of the local authorities and communities and the implementation of first-aid measures varied in effectiveness. These include the retrieving of valuable objects from the debris, i.e. gilded metal sculptures, wood carvings and stone reliefs, and the covering of affected buildings specifically damaged roofs - in retrospect, all measures that proved to be essential after the earthquake and facing the monsoon. In 2010, the Institute of Conservation of the University of Applied Arts, Vienna joined the conservation project at the impressive Royal Palace in Patan. The project had been initiated by the Kathmandu Valley Preservation Trust (KVPT). This cooperation between senior conservators (staff) and students of the Institute, together with architects from the KVPT and local craftsmen, has over the years resulted in the conservation of numerous monuments and works of art made of stone, wood, metal, and ivory.

This paper will give a preliminary survey of the damage caused by the earthquakes to the monuments at the Patan Durbar Square, and in the context of the Royal Palace, an evaluation of treatments undertaken by the Institute over the past years. Fact-finding missions in June and September 2015 initiated by the Austrian government, shed light on the necessity to set specific priorities for conservation and restoration of earthquake-damaged monuments for forthcoming working campaigns. Emphasis will be given to the emergency response and first-aid measures undertaken by stakeholders, which can be considered effective for the recovery of objects from the debris and their temporary storage. The conservation and restoration of monuments and objects damaged by the earthquake undertaken by the Institute will be illustrated. Tasks and challenges for the future will be defined and possible solutions discussed.

Cultural Heritage During Armed Conflict and Planning for the Future in Syria and Iraq: The ASOR Cultural Heritage Initiatives

Allison Cuneo, Project Manager, Cultural Heritage Initiatives, American Schools of Oriental Research; LeeAnn Barnes Gordon, Project Manager for Conservation and Heritage Preservation, American Schools of Oriental Research; Michael Danti, Academic Director, American Schools of Oriental Research; Susan Penacho, Project Manager for Geospatial Initiatives, American Schools of Oriental Research

The armed conflict that began in Syria in 2011 has produced a catastrophic humanitarian crisis. In 2014 the regional nature of the situation escalated, beginning with the take-over of Mosul, Iraq by ISIL, followed by their subsequent gains in territory. In Syria alone, combat has reached every region with nearly a third of the population internally displaced and more than four million having left the country as refugees. War-wearied Syrians and Iraqis struggle with a loss of identity and lack of control over their lives, and these feelings are compounded by the destruction of their cultural heritage. Thousands of cultural properties have been damaged through combat-related incidents, theft, and intentional destruction. This paper examines the impact of the conflict on the protection of cultural property by discussing the activities and outcomes of the Cultural Heritage Initiatives (CHI) project, a cooperative agreement between the US Department of State and the American Schools of Oriental Research (ASOR).

In addition to the Syrian Ministry of Culture's Directorate-General of Antiquities and Museums and the Iraqi State Board of Antiquities and Heritage, many local and international groups have been engaged in efforts to safeguard cultural heritage in the region. By 2013, following the first few years of the war in Syria, UNESCO placed all six of the country's World Heritage Sites on their List of World Heritage in Danger due to severe and sustained damage and threats. Soon after, international responses

to the cultural heritage crisis increased rapidly, including the formation of the ASOR CHI project in August 2014. The CHI project aims to develop comprehensive documentation for the current condition and preservation needs of cultural heritage in Syria and Iraq.

CHI activities include gathering and archiving information about the condition of cultural heritage from online media, satellite imagery, and in-country sources. Working collaboratively with other groups and agencies, CHI has compiled lists of heritage resources to create an inventory and map of archaeological sites, religious and secular historic sites and monuments, museums, archives, and libraries in both countries. This information is used to complete remote condition assessments to help better understand patterns of damage and preservation needs. These assessments will be critical for prioritizing on-the-ground conservation activities in the initial post-conflict recovery period.

Constant monitoring of the crisis allows CHI to identify potential emergency response measures that can prevent and decrease future damage to sites and collections. When possible, the project supplies Syrians with resources and technical advice to carry out these mitigation projects. In addition to these short-term actions, CHI develops rapid assessment tools, large-scale preservation projects for major heritage sites, and capacity building activities for future post-war implementation. Overall, through a wide range of activities, CHI documents the impact of the war on cultural heritage and plans preservation actions for the future. This discussion of the CHI project illustrates the challenges of protecting cultural heritage during armed conflict and considers responses that engage local stakeholders. Ultimately CHI seeks to develop best practices for cultural property protection.

GO - Emergency Response— Track C

Nobody Expects the Spanish Inquisition: Developing protocols for protecting Israeli museum collections from armed conflict

Rachael Perkins Arenstein, Conservator, Bible Lands Museum Jerusalem; Sharon Tager, Conservator; Hod Hasharon Conservation Studio; Irit Lev Beyth, Head of Chemistry Conservation Lab, Israel Museum Jerusalem

The loss of cultural property in the Middle East has received intense news coverage over the past few years. Publications that address the complexities of protecting heritage in the face of armed conflict or examine previous failures and successes from World War II through to the 2003 Iraq war are increasing. However, in the summer of 2014 in the midst of a military offensive named "Operation Protective Edge" by the Israeli government, the current literature failed to usefully address the issues experienced by conservators in Israeli museums.

Since 2000 Israel has been involved in, or the site of, five armed conflicts. These short wars or "operations" have occurred every two to three years and result in the puncturing of the rhythms of what is normally a Western-style culture and lifestyle with intermittent bombings and missile attacks. Unlike the long-running armed conflicts that have consumed Israel's Middle Eastern neighbors where museums and sites suffer from targeted and sustained damage, within Israel, cultural institutions have not been specifically targeted for attack. However, the weapons and tactics in use are not precise enough for institutions to feel that they need not prepare for a catastrophic event. While some Israeli museums have emergency and disaster plans that consider terrorism and war events, the intense push seen in North America in developing emergency protocols has not reached Israel despite the obvious need. Many institutions have lists of their most important or valuable artifacts and a few have plans for what to do in the event of a war. But deciding when to implement these protocols in the face of sporadic attacks is often a difficult judgement call resulting in delays that make them ineffective considering the fast-moving nature of the conflicts. In fact, most nations have not been proactive in developing emergency protocols for situations of armed conflict and acts of terrorism, in spite of recent current events.

This paper will outline the challenges noted during a conservator-led initiative for developing stronger emergency protocols for Israeli museums with moveable cultural heritage. Recommendations for linking implementation of emergency preparation steps to local security alert levels will be discussed, as well as other recommendations for exhibition and renovation that facilitate speedy action and long-term protection of art and artifacts in a volatile area.

The Emergency Response Team at the Centre de conservation du Québec

Éloïse Paquette, Paintings Conservator, Centre de conservation du Québec

The Centre de conservation du Québec (CCQ) is a leader in the field of art conservation in Canada. It has long been involved in emergency response procedures meant to be applied throughout the province of Quebec. Over the years, it has developed materials specific to disaster prevention and, most importantly, it has elaborated an intervention plan. The CCQ has formed an emergency response committee consisting of several conservators from different fields of expertise in the interest of providing the best possible assessment of the problems at hand. The committee members are also part of an quick response team which can be deployed at anytime to disaster sites anywhere in the province. The team has organized a quick- response tool kit for its purposes. The materials, which are solely destined for use by the emergency team, are kept in well-marked boxes in a specific location, always ready for use. The specific materials will be discussed in greater detail during the presentation. Significantly, several major institutions in the province of Quebec possess emergency plans and

have entered into specific agreements with the CCQ for the latter to act in the event of an emergency situation. Moreover, all the conservators employed by the CCQ must be ready to be deployed if needed, and may be contacted through the use of an emergency telephone pyramid. Several disasters have occurred over the years in Quebec province. The CCQ has been involved in some of these, including, most recently, a fire that took place in 2014 at the Musée de la Civilisation de Québec. Prior to that, there was a huge fire in 2008 at the Voltigeurs de Québec Armoury. The ice storm of 1998 had a major impact, affecting, in particular, the Lachine Museum in Montreal. Each of these cases will be presented in greater detail. Every one of these events was instrumental in helping the CCQ to improve its emergency response procedures; following each emergency, post-mortem meetings were carried out to fully assess the exercise : what went right and what could use improvement.

Living with Water: The Whitney Museum of American Art's Transformative Flood Mitigation Approach

Scott Newman, FAIA, Architect, Cooper Robertson

The location of the new Whitney Museum of American Art is particularly sensitive to water level rise and storm surge. The new 220,000 square foot museum, which opened this year in New York City, is immediately adjacent to the Hudson River. The design of the building anticipates the effects of climate change and protects the museum's staff and collections from severe storms with flooding through both planning and resilient design features. The original design for the building was planned to resist and mitigate the potential impacts of severe climatic events. The ground floor level was elevated above the pre-Superstorm Sandy recommended FEMA level. No significant gallery spaces or art storage was planned to be located below level five. When Superstorm Sandy hit New York City in October 2012, the museum was under construction and the ground level and below grade structure of the building was in place with no exterior walls.

The timing of the storm enabled the team to see how the building would perform in a serious flooding event. The open structure withstood the storm well, but a historic storm surge brought unprecedented high water levels, with over six million gallons of river water filling the building's 30 foot deep basement. Following the storm, FEMA revised its flood zone maps, recommending an additional 4.5 foot elevation for building on the Whitney site. With the understanding that the new FEMA elevation did not account for sea level rise, the Whitney team conducted an international search for an advisor to assist in developing a more realistic flood elevation recommendation. They selected two organizations well versed in protecting urban environments from floods: WTM Engineers of Hamburg, Germany, and their partner, the Franzius Institute for Hydraulic, Waterways, and Coastal Engineering of the Leibniz University of Hanover.

The Franzius Institute undertook an extensive study of New York Harbor and its environmental history, and advised that the building should be protected to a higher elevation anticipating projected sea level rise. Based on these studies, the design team designed modifications, both permanent and deployable, to the Whitney's structure that will protect it against future storm events. The new Whitney Museum represents an unprecedented addition to New York City's cultural landscape, and the building's resiliency strategies demonstrate a successful precedent for protecting collections for any institution planning to build on the world's changing waterfronts. The museum was designed by the Renzo Piano Building Workshop in collaboration with Cooper Robertson. The devastating effects of the storm on New York City's infrastructure inspired a transformation in the practice of flood mitigation, and the timing of the Whitney Museum project has put the project team at the forefront of addressing museum building resilience.

Collections Emergency Planning for London

Sharon Robinson, Collection Care Manager, Museum of London

The Museum of London is one of the Arts Council England's (ACE) lead partner museums in the UK and as such plays a significant role in the co-ordination of emergency planning resources across London's Regional Museums.

This paper will outline the strategies and tools which the Museum of London's collection care team have put in place to assist smaller organisations to plan for an emergency as well as raising awareness of collections emergency planning amongst its own management and staff.

In 2009-2010 the Museum of London commissioned a needs analysis of collections emergency provision and resources across 250 London museums. This study helped us to understand our capacity to respond to an incident in the capital and prompted further work to better equip London's museums through training provision and improved communication.

A series of network groups across London have been established in order to share geographical skills and resources and members of the groups receive training, equipment and assistance to write their own emergency and salvage plans. As part of this work the Museum of London developed and launched an innovative Collections Emergency Planning E-Learning Tool, a free web based illustrated guide to emergency planning which sits on the Museum of London's website for anybody to use. The tool facilitates the delivery of cost effective desk based learning, takes twenty minutes to complete and is used to underpin practical training courses. It allows us to communicate the principles of collections emergency planning to a whole organisation and raise awareness across broad groups of staff and volunteers. This combination of approaches is working to better prepare London's museums for an incident that we all hope will never happen.

Ready for Reaction: Harvard's Library Collections Emergency Team

Lauren Telepak, Collections Conservator, Harvard Library, Harvard University; Priscilla Anderson, Senior Preservation Librarian, Weissman Preservation Center, Harvard University

Harvard University's seventy+ library system has an extensive network of emergency planning, preparedness, response, and recovery resources. The cumulative impact of an average of ten emergencies each year has necessitated maintaining a broad-based program with the Library Collections Emergency Team as the centerpiece, allowing us to confront new and unexpected challenges with confidence in our ability to make well-informed decisions on the fly. The Team is a dynamic program that evolves to meet changing needs of the University by building and maintaining strategic collaborations within and outside of our broad community. Our story can inspire regional networks with ways to increase their effectiveness by sharing responsibilities, developing and training around best practices, reducing stresses to improve response quality, and taking advantage of existing resources.

Harvard's Library Collections Emergency Team consists of 20 conservators and preservation professionals with a variety of backgrounds and specialties (book, paper, photo, audiovisual). We have responded to 112 incidents in 15 years, including challenges such as burst storm drains, plumbing and HVAC failures, mold outbreaks, and pest infestations. The team provides 24/7 phone advice and in-person response support. As a large group, we distribute responsibility among team members and use a buddy approach to support thorough communication and decision-making. We have worked with Harvard's environmental health and safety group to develop best practices for safe emergency response.

Through a critical and unusually robust training program, we have created a centralized response team that is highly effective, and a community of library staff who are comfortable with initial response procedures and emergency planning. Bi-annual intensive, hands-on training consists of a mock water emergency with a variety of deaccessioned collection materials in which participants learn first-hand how to be aware of their own safety, communicate to initiate response action, take preemptive action to prevent further damage, and set up a salvage operation. Other training components include material-specific salvage techniques (i.e. audiovisual identification and salvage), tabletop exercises, emergency planning workshops. Lessons learned over the years include: how to write your plan so that it can actually be used during an emergency; how not to underestimate the impact of emotions and stress during an emergency; how to improve safety through training; how to evolve an emergency program with the needs and capabilities of the community; how to deploy a response team into an unfamiliar situation; how to organize effective debrief meetings. We hope other regional or other networked emergency teams could benefit from our mistakes and developments over time.

Building a Foundation for Cultural Recovery, Resilience and Future Conservation Efforts in Haiti after the 2010 Earthquake

Stephanie Hornbeck, Founder and Director of Conservation; Caryatid Conservation Services, Inc.; Olsen Jean Julien, Director, Phenixience, Consultation and Development Firm

From 2010–2015, multi-disciplinary efforts have been progressing to build capacity to protect cultural heritage in Haiti after the major earthquake that struck the Port-au-Prince region in 2010. The Smithsonian Institution Haiti Cultural Recovery Project was formed in partnership with the government of Haiti to assist Haitian culture professionals in the recovery of their gravely damaged cultural heritage. This project evolved into a longer-term effort to formally establish cultural conservation in Haiti, culminating in this year's inauguration of the Cultural Conservation Center at Quisqueya University.

The authors collaborated in the recovery mission as chief conservator and cultural recovery center director respectively; our paper aims to present the transition from a cultural recovery project to the foundation of a national conservation center in Haiti. The 7.1 magnitude earthquake, yielded horrific humanitarian consequences, as well as widespread destruction of built heritage and dramatic damage to collections. An estimated 280,000 people perished and 1.5 million others left homeless. The response to the cultural devastation was secondary, although deemed of importance by international cultural organizations.

In March 2010, the Haiti Cultural Recovery Project was proposed whereby the Smithsonian Institution would support the efforts of Haitian colleagues. The project faced such serious challenges that the success of our mission seemed elusive. We had to build a cultural recovery infrastructure to address a catastrophe of devastating proportions in a tropical climate, while simultaneously training a local base of preservation professionals.

A combination of key variables turned our mission into a successful model of disaster recovery and building resilience. Successful heritage recovery involves a collaborative effort among different people and institutions sharing common values. Collaboration with various partners was crucial for this project to succeed: the Haitian Government; Haitian, U.S., and international institutions that could provide human resources and a knowledge base needed to solve technical and practical problems; Haitian cultural agencies and private organizations which own collections; training institutions and universities; and the media. By the means of a series of differentiated agreements, collaborative conservation strategies, and through constant communication, our project bridged these partners to achieve meaningful results. Approximately 30,000 artworks, books, documents, monuments and wall paintings from 20 institutions were recovered. AIC was an important partner, contributing significant logistics coordination of both volunteer deployments and critical supply procurement. Fifty conservators and collection managers from the United States, Canada and Europe participated in our project in various

capacities. The June 2015 inauguration of the purpose-built Quisqueya University conservation center in Port-au-Prince demonstrates a serious commitment by Haitian culture professionals to heritage preservation. Moreover, this Center is the first Francophone conservation center in the Caribbean and only the second center in the region. As Haiti sits on two seismic faults and is regularly subjected to other disasters, primarily tropical storms and hurricanes, future disaster recovery activities will likely occupy the Center. The aftermath of a major catastrophe requires years of dedication because damage is both severe and widespread. In Haiti, perhaps a quarter century of work remains. Going forward, we have new challenges and opportunities.

Hearing from a Group - Two Panels on Collaborative Efforts Following Recent Disasters—Track D

Saving and Preserving Family and Local History from Natural Disasters: Addressing Challenges from the 2011 Earthquake in Japan

Kazuko Hioki, Conservation Librarian and Liaison Librarian for Asian Studies, University of Kentucky Libraries; Daishi Yoshihara, Ph.D., Associate Fellow, National Research Institute for Cultural Properties, Tokyo; Masashi Amano, Ph.D., Assistant Professor, International Research Institute of Disaster Science, Tohoku University; Tomoko Yasuda Ishimaru, Paper Conservator, Tokyo Restoration & Conservation Center (TRCC)

Japan has frequently been devastated by natural disasters, including the 2011 Great East Japan Earthquake and Tsunami and the 1995 Hanshin Awaji Great Earthquake. Motivated by the 1995 Earthquake, historians, educators, and citizens developed a multidisciplinary, volunteer-based group: Network for Preserving Historical Materials, know as Shiryo-Net. It has worked as an information clearinghouse in times of disaster, implemented educational workshops for volunteer citizens, helped launch regional groups, and promoted the mitigation of future catastrophes.

In the aftermath of the 2011 Earthquake, Shiryo-Net played a key role in rescuing and conserving damaged historical records by mobilizing volunteer citizens. Experts in the preservation field, on the other hand, joined a rescue operation launched by the Agency for Cultural Affairs, which administers publicly funded museums and cultural facilities. This operation, called the Cultural Properties Rescue Program, was a two-year limited time enterprise and operated through publicly raised donations. It purchased supplies, consulted on the salvage of cultural properties, and sent conservators from public museums to the disaster affected regions. This panel, consisting of researchers and conservators from Japan and the US, will discuss the activities and roles of Shiryo-Net and the preservation specialists involved in the 2011 Earthquake.

First, Kazuko Hioki will briefly review the policies and disaster responses of cultural organizations such as the Agency for Cultural Affairs and The Japan Society for the Conservation of Cultural Property. She will compare and contrast them with their North American counterparts and provide background information on Japan's historical and social environment.

Next, Dr. Daishi Yoshihara will discuss his activities with Shiryo-Net to promote disaster preparedness for historical local archives. He has been actively involved in educating citizens to preserve their family and local history by giving workshops for salvaging water-damaged documents. His talk will provide a progress report on preparedness and responses since the 1995 disaster, and set the stage for the next talk.

Dr. Masashi Amano will review the 2011 tsunami disaster and analyze Shiryo-Net's responses and strategies by asking the following questions: What were the strengths and weaknesses of this operation? What roles did the mobilized citizens play in rescuing the damaged artifacts? Was the reliance on volunteers sustainable? What are the current conditions of the saved documents? Were they treated and returned to their owners and museums?

Finally, Ms. Tomoko Yasuda will talk about the roles of conservation professionals during and after the 2011 tsunami disaster. She will discuss a potential project between the various non-profit organizations, a for-profit conservation business, and state agencies to collaborate on treating the water damaged family documents. This collaboration exhibits the difficulties of dealing with massive amount of salvaged documents and reminds us the greatest challenges come after the initial salvage efforts. It also presents a model for repairing, organizing, and returning the disaster affected artifacts.

We will conclude with an appeal for new ideas, networking, and international collaborations. We hope this session will share our experiences with the audience and stir discussions on approaches to mitigate the damages of future disasters.

To Protect and Preserve: Collaborative Efforts to Build and Sustain Cultural Heritage Emergency Networks

Lori Foley, Administrator, Heritage Emergency National Task Force, FEMA/Smithsonian Institution; Alexandra Ellem, Senior Tutor and Conservator of Paintings, University of Melbourne, and Private Practice; Fiona Macalister, Preventive Conservator and Consultant; Julie Page, Co-Coordinator, Western States & Territories Preservation Assistance Service (WESTPAS), California Preservation Program; Malia Van Heukelem, Preservation Specialist, Hamilton Library, University of Hawaii

Emergency managers recognize that close collaboration, good working relationships, and established networks are key to

successful response and recovery efforts following a major disaster. Agencies and organizations in the United States, the United Kingdom, and Australia have taken their cue from emergency management and developed collaborative approaches to prepare heritage organizations to prevent, mitigate, respond to, and recover from disaster. This session will look at a number of different models of cultural heritage emergency networks on three continents:

- The California Heritage Protection Project, a six-county pilot project that is testing a partnership model to improve emergency preparedness at cultural institutions in all 58 counties in the state
- The Hawaii Emergency Network for Cultural Heritage, established in 2013 following a State Heritage Emergency Partnership forum conducted by Heritage Preservation, and the challenges of outreach and response within the island state and to US territories in the Pacific
- A diverse array of networks in the United Kingdom of Great Britain and Northern Ireland, including the East Midlands Museums Service Emergency Response Team, the London Heritage Salvage Network, and the Northern Ireland Coordinating Committee for Heritage Emergencies

Australian disaster networks strengthened by Memoranda of Understanding (MOUs) – from Darwin, Northern Territory; to the state of Queensland; to Canberra, Australian Capital Territory; and southward to Ballarat, Victoria. Panelists will compare and contrast their network's genesis, mission, scope, governance structure, communication (outreach and information sharing), unique challenges, and, if a network has responded to a disaster, its role and responsibilities. Particular attention will be paid to common issues and concerns that confront each network – funding, sustaining an all-volunteer effort, getting cultural heritage on the radar screen of emergency managers, and institutionalizing the concept of the protection of cultural heritage at the county or state level.

Lead by Example - Models to Follow—Track E

Our Place in Line: Response Protocol for Conservators Following Major Disasters

David Goist, Conservator of Paintings, Goist Art Conservation

In March 1855, students rushed into the burning Nassau Hall at Princeton University to save the painting "Washington at the Battle of Princeton" by Charles Willson Peale. As I treated this painting while interning with Bernie Rabin at the Princeton University Art Museum in 1975, I imagined myself being part of the heroic effort to save this important piece of American history. Many conservators, upon hearing of a major disaster, also imagine themselves being part the cavalry charge to save the day. While conservators are able to respond quickly to local building fires and floods, once cleared for safe access, providing aid to sites within a major disaster zone requires restraint. True First Responders are law enforcement, firemen, and emergency medical staff.

Facts and Guidelines for conservators to remember following a major disaster:

1. Do not attempt to access a major disaster area until invited.
2. Do not become a burden to those you are trying to help. Food, water, and fuel supplies may be limited.
3. When invited, try to go with adequate food and water for yourself.
4. Once Incident Command System rules are enacted, they must be followed. Become ICS 100 certified and know the chain of command. http://training.fema.gov/emiweb/is/icsresource/trainingmaterials.htm
5. Understand, the person with the keys to the door of the site you want to help may have evacuated to another state.
6. Understand that there may not be open hotel rooms anywhere near the disaster area as they are filled with displaced persons. If airports are open, rental cars may not be available. Gasoline may be rationed to First Responders. Access roads may have been rendered impassible.
7. Once contact is made with staff at a disaster site, be ever mindful of their psychological state and be prepared to provide emotional support.
8. Maintain awareness of the psychological state of your co-responders. Fatigue, both physical and emotional, can strike quickly. First Aid skills can also become important.
9. Be prepared to perform basic triage condition evaluations first, followed by establishing recovery priorities with site staff. Then perform basic stabilization and relocation efforts. Experienced members of AIC-CERT often possess the MacGyver skill to solve any problem with duct tape and twine. Solving problems in the field after a disaster is not the same as being in the conservation studio.
10. Be cautious when talking to the media. Avoid commenting on value of collections or any perimeter weakness which could become a security risk for the site you are helping.

PRICE: Preparedness and Response in Collection Emergencies

Sarah Stauderman, Director of Collections, Hirshhorn Museum and Sculpture Garden; William (Bill) Tompkins, Director, National Collections Program, Smithsonian Institution

This paper will provide an overview of a Smithsonian Institution initiative to develop an internal collaborative for addressing

preparation and response teams for collection emergencies. With 19 museums, the Institution has extraordinary challenges and multiple resources for managing emergencies that affect collections. In the past three years (2012-2015), colleagues at the Smithsonian Institution have discussed the roles that we play in preventing, preparing, and responding to emergencies. Even with a robust disaster management program at SI, we discovered that we needed to do a better job of planning for emergencies that affect collections. We know that the offices charged with life safety at the Smithsonian will do a great job managing the people and many visitors at the Institution in an emergency, but what about the collections?

Our team came up with a concept that we are bringing to the administration of the Smithsonian, called "PRICE" – Preparedness and Response in Collections Emergencies. Each of the museums at the Smithsonian functions with its own set of plans for emergencies, but we recognized that at a big place like the Smithsonian there might be scenarios that require the help of the Institution at large.

What if a museum needs help from a team of external conservation experts because it is overwhelmed with recovery? What if having a collections emergency recovery contract in place ahead of time, for instance, from a dry-freezing company, would spare a collecting unit from spending the valuable post-recovery time having to write and execute a contract? What if one unit has equipment and supplies needed by another unit? The PRICE concept would provide staffing, training, logistics and administrative support that pertain especially to collections before, during, and after a disaster. At the Smithsonian we follow the Incident Command System (also known as ICS) for emergencies, and the PRICE concept fits into the structure as one of the reporting nodes to the incident commander. We think that the model that we are proposing will help the Institution take care of its 137 million collection items. Stewardship of our collections must include ongoing review of collections emergency plans and put the emergency preparation, response and recovery experts in touch with one another.

Damage and Destruction of Cultural Heritage in Poland: Lessons from the Past, Initiatives for the Future

Joanna Sobczyk, Conservation Scientist, The National Museum in Krakow/Laboratory of Analysis and Non-Destructive Investigation of Heritage Objects; Julio M. del Hoyo-Meléndez, Conservation Scientist, The National Museum in Krakow/Laboratory of Analysis and Non-Destructive Investigation of Heritage Objects

Polish cultural and natural heritage has been threatened with destruction due to physico-chemical causes of decay as well as to social and economic conditions. Human impact and natural disasters have clear consequences on the environment and on objects of cultural interest. Although Poland has generally been included in the group of low risk countries, natural disasters have caused serious problems to cultural property. An example of this was the 1997 Central European flood, in which numerous museums, libraries, archives and historic buildings were affected. The increasing number of natural disasters in Europe during the 1990s shows the vulnerability of significant cultural assets and the lack of preparedness of local emergency services. Although many efforts are still underway, many European cities are still not prepared to protect their cultural heritage against these catastrophes. ICOMOS Poland has listed the principal types of threats faced by the country's monuments and sites. These include fire hazard, danger due to modernization of industrial sites, threats to military cultural heritage places, deterioration due to lack of use or insufficient funding, as well as theft and smuggling. As a result of previous devastations, a series of evaluations have been carried out with the aim of developing guidelines and regional coordination programs to be ready for future disasters. Risk management plans have been devised focusing on natural disasters, but little attention has been paid to human-made disasters. For instance, Poland has experienced a number of human-made disasters of which those produced during the Second World War are worth remembering. Some of the measures that embrace the protection of Poland's natural and cultural heritage will be presented, from national to regional initiatives.

An example at the national scale is the case of Warsaw, a city that was deliberately annihilated by enemy troops during WWII in an attempt to destroy the identity of Polish people. Nonetheless, after the war, Poland decided to rebuild the city on the basis of available photographic and written sources. Likewise, an important earlier regional initiative was the establishment of the National Museum in Krakow in October 7, 1879 by a resolution of the Krakow City Council. This was the first National Museum at a time when the Polish people were deprived of their own statehood and country. Since its foundation, the National Museum has always been committed to protecting the cultural heritage objects entrusted to it. A more recent goal of the Museum is to develop and implement adequate preventive conservation practices that are aimed at lowering the risks and minimizing the damage to its collections, associated with natural and human-made disasters. A series of case studies will show how the collections have benefitted from the collaboration between museum administrators, collection managers, conservators, and scientists. The result of these partnerships have allowed devising and implementing collection care strategies within various museum areas including exhibition, loans, transport, and storage.

Alliance for Response New York City: Collaborations to Protect and Preserve Cultural Heritage

Elizabeth Nunan, Co-chair, Alliance for Response New York City; Cynthia Albertson, Principal Conservator, Albertson & Nunan, Inc

This presentation highlights the innovative national initiative Alliance for Response, that has been bringing together cultural heritage and emergency management professionals at the local level – where all initial disaster response occurs – since 2003. Formerly a volunteer facilities group, Alliance for Response NYC (AFRNYC) has worked to help New York City cultural institutions prepare for the inevitable emergency through programming and partnering with agencies and related organizations. AFRNYC is focused on connecting emergency responders with representatives of the New York City cultural heritage community. Our goal is to strengthen local mitigation and response capabilities through training opportunities, local planning efforts, and improved dialogue and partnerships. Our nearly 500 members represent private individuals, nonprofit organizations, businesses, public agencies, and other institutions interested in the preservation of New York City's cultural holdings.

We will provide an overview of Alliance for Response and discuss the formation of the AFRNYC network, and how its role in the cultural community has evolved. The history of AFRNYC programming and the importance of establishing strong collaborative ties with the NYC emergency management community will be addressed. The role played by AFRNYC in coordinating preparedness and response efforts in the cultural community before, during, and after Hurricane Sandy will be summarized. Throughout the crisis AFRNYC was a key player, and our participation in outreach projects, assistance with the assembly of the AIC-CERT Cultural Recovery Center, and information collection about affected institutions led to creative and effective support for affected institutions and artists. Through these efforts we attained a better understanding of how we could strengthen our assistance to the cultural community as we prepared for subsequent disasters. As a result of a grant received after Hurricane Sandy from the New York Community Trust in 2013, AFRNYC has undergone many changes. One of the goals was to strengthen the group's organizational structure to support an expanded mission, and improve collaboration with government and other not-for-profit organizations locally and nationally. The formation of a local Heritage Response Team (HRT) trained in response planning and salvage, has strengthened the ability of NYC's and New York state's cultural community to prepare for and respond to disasters. HRT Training combined aspects of the AIC CERT training, select instructors from the National Park Service, and key safety instruction from representatives from the NYC Office of Emergency Management. In addition to an emergency hotline, the team is assisted by the development of the AFRNYC Response Tool - a software package that tracks the location of constituents, administers the deployment of the HRT members and volunteers using mapping capabilities, and organizes reporting. Over 200 museums, libraries, archives and approximately 500 performing arts organizations and nonprofit galleries will benefit in future emergencies by our understanding their needs better in advance, and training responders to assist them following a disaster. This collaborative approach to protecting our valuable cultural resources can help ensure that our communities can rebound and recover when, not if, disaster strikes.

Emergency Care for the Nation's Records

Doris Hamburg, Director of Preservation Programs, National Archives and Records Administration

We are a nation that believes in the power of information, expects transparency and wants what we need to be available now. The National Archives and Records Administration (NARA) is charged with preserving the nation's records, and has a unique mission and role in addressing emergencies that can cause loss and destruction of the records of the nation – from the sublime to the ridiculous. The foundation of this belief and expectation is the preservation of records; records of the government, or our institutions and communities and of our personal lives. The post-Katrina images of citizens seeking options to establish their identities highlighted the key role that records play for each of us and in society.

With 44 facilities of varying age across the US, the National Archives has extensive experience with records emergencies. The National Archives' approach to emergencies - risk assessment and mitigation, preparedness, response and recovery options and costs – can be viewed as an integrated system. The system is scalable from the large to smallest institution. NARA works both at the agency and individual facility levels. The impact of the disastrous 1973 fire at the National Personnel Record Center in St. Louis continues to this day. Since then NARA has continued to change facility standards in order to minimize risk; risk mitigation is an ongoing process. Also, critically important, we have built an emergency preparedness planning network that includes the Federal Records Centers, Field Archives and Presidential Libraries in 17 states. The goal is to minimize the number of emergencies, and the chance of those emergencies becoming disasters. Emergency preparedness planning includes staff and facility plans at all facilities; we ensure that preservation expertise is available 24/7 through our Conservator-on-Call team. We provide training for staff.

The National Archives and Records Administration addresses emergency preparedness and recovery of records with the specific requirements of security classification, maintaining specific order and organization of the records and ensuring the integrity of the information. Recovery of records has a particular trajectory that depends on planning well in advance of any event, quick and informed action and collaborative decision-making in the face

of a large volume of typically unique information on a range of formats. NARA shares its information about the specific requirements for the recovery of records through the contracting vehicle we have prepared for securing vendor services when needed.

The National Archives serves as a resource for advice and guidance to federal agencies, state, tribal and local governments and the private sector on response and recovery for records. We maintain an External Records Emergency Committee to facilitate communication and networking. In the event of a presidentially declared emergency in the US, under the National Response Framework, the National Archives may be tasked with leading response efforts pertaining to records. This capacity is overseen through the Essential Support Function #11 – managed by the Department of the Interior.

Weather-Related Events and Historic House Museums: A Ten Year Review of Emergency Preparedness and Mitigation at Historic New England

Benjamin Haavik, Team Leader, Property Care, Historic New England

With thirty-six historic house museum properties and one collections storage facility spread out in five New England states, the small but dedicated staff at Historic New England are always working to protect the cultural resources under their care. From microbursts to hurricanes, there is a never-ending barrage of weather related events to deal with and climate change has only intensified these events with higher amounts of moisture, higher intensity of lighting, and more damaging winds. Emergency preparedness, by necessity, is a never-ending process at Historic New England. The Mother's Day floods of 2006 stretched Historic New England's resources thin during the worst flooding in New England since the hurricane of 1938. This storm highlighted some noble efforts to protect the resources but also major organizational deficiencies. Ice storms during 2008 showed the potential for damage if tree care did not receive a higher priority while a series of rain events in March 2010 resulted in an effort to explore and resolve drainage issues at the historic sites. A chain of severe lightning strikes during 2010 and 2011 led to analysis of existing lightning protection systems as well as the need for surge suppression in today's age of sensitive computer equipment. More recently, the record-breaking winter of 2015 illustrated weaknesses in our snow and ice dam mitigation arsenal. Historic New England has continually evolved our approach to preparedness and planning with each event. For example, one outcome from the 2006 floods was Disaster Day, a day dedicated to emergency preparedness. Disaster Day started with only the building and landscape staff attending. In the nine years since, Disaster Day has grown to include staff from all areas of the organization including site managers, collections and conservation staff, IT, guides and educators; all participating in different forms of training and sharing their response stories and lessons learned. In addition to Disaster Day, Historic New England has also initiated a campaign of risk assessments, improved pre-storm communication protocols, reviewed the access and response issues related to being a regional organization, and has been working with a statewide preparedness group for cultural resources, COSTEP Massachusetts, on an initiative to better integrate cultural resources with local responders. The weather related events also resulted to mitigation initiatives that range from drainage to lightning and surge suppression. Working with a historic house property, each potential mitigation effort has to be carefully reviewed comparing its ability to mitigate the issue and protect historic fabric with the effect the effort might have on historical authenticity. This paper will discuss the key weather related incidents and highlight how each have affected both emergency and project planning at Historic New England, provide an understanding of basic and complex mitigation efforts that might be undertaken at historic properties, and detail the different preparedness initiatives undertaken over the last decade.

Involvement of Microbes in Cultural Heritage Protection at Angkor Thom, Cambodia

Ji-Dong Gu, Associate Professor, University of Hong Kong; Yoko Katayama, Professor, Tokyo University of Agriculture and Technology

The temples of Angkor monuments including Angkor Thom and Bayon in Cambodia and surrounding countries were constructed with sandstone exclusively. They show severe deterioration caused by physical, chemical and biological processes and, among them, the active growth of microorganisms on the sandstone surfaces leading to biodeterioration cannot be ignored, but knowledge on the microbial community and composition of the biofilms on the sandstone is not available from this region. This study investigated the microbial community diversity by examining the fresh and old microbial biofilms on the sandstone bas-relief wall surfaces of the Bayon temple by analysis of 16S and 18S rRNA genes-PCR amplified sequences. A comparison of the microbial communities showed that the bacterial (prokaryotic) community of old and fresh biofilms was very similar, but the eukaryotic communities were distinctly different between them. This information illustrates the dynamic processes of formation and succession of microbial communities on sandstone in tropic region. Because biofilms are detrimental to the bas-reliefs engraved on the surface of sandstone, information about the microbial community is indispensable to subsequent control of biofilm colonization. Non-destructive sampling of biofilms with different colors revealed novel bacterial groups of predominantly Rubrobacter in salmon pink, Cyanobacteria in chrome green, Cyanobacteria and Chloroflexi in signal violet, Chloroflexi in black gray, and Deinococcus-Thermus, Cyanobacteria, and Rubrobacter in blue green. Serial peeling-off of a thick biofilm by layers over depths with adhesive sheets revealed a stratified structure: the blue–green biofilm associated with serious deterioration was very rich in Cyanobacteria near the surface and Chloroflexi in deep layer below. Nitrate ion concentrations were high in the blue–green biofilm. The characteristic distribution of bacteria at different biofilm depths provides valuable information on not only the biofilm formation process but also the sandstone weathering process under the tropical climate conditions. Ammonia-oxidizing archaea (AOA) amoA gene was amplified and investigated from Bayon temple, Angkor Thom. The results confirmed the detection of three large clusters, namely the Soil/Sediment, the Nitrososphaera gargensis, and the Water Column/Sediment. Obtained sequences fell into all three clusters and most of the clones were in the Soil/Sediment cluster. The diversity of AOA amoA gene in Bayon was significantly high, indicating their contribution to production of nitrate from ammonia. AOB amoA gene-based PCR primer failed to generate any target DNA fragment bands after PCR amplification. AOB 16S rRNA gene was then used to amplify and detect AOB existence and abundance. AOB in all of the three samples from Bayon were much lower than AOA. The

information collectively suggests that microorganisms are widely present on surface of sandstone temples and they are responsible for the different colors on surface, and their activity is responsible for biodeterioration through nutrient cycling.

Use of Façade & Art Documentation Surveys for Historic Cultural Architecture and Art for Future Possible Restorations in Case of Disaster

Robert Alden Marshall, Director/Senior Conservator; R. Alden Marshall & Associates, LLC; Battle Brown, Founder/Owner, Manassas Consulting, LLC

Presenting high quality information in a usable format is the key to guiding a successful restoration project after an emergency or disaster. We describe how 21st century photogrammetry coupled with web based technology, computers and internet, were used to document and guide a 1936 Texas Centennial Fair Park Bas Relief Existing Condition Assessment and Preservation Plan development in anticipation of a future restoration project. This investigation and documentation method resulted in documentation that provided better information and hence more project control, reduced equipment and manpower effort during the investigation phase. Detailed scaled documentation would provide the bidders as well as the next generation of preservationists and owner representatives a readily accessible record on which to base restoration project in the event of a disaster. Photogrammetric imagery used to produce blueprints with full surface texture is demonstrated. These blueprints enhance productivity, development of work scope and project management. High resolution photo inspections viewed interactively side-by-side online with these blueprint substitutes were used to assist in RFP development and bidder review of work scope for the project. In a partial disaster future imagery could be paired with baseline documentation to develop work scope using the comparison viewer. We demonstrate how the documentation tools allow for close-up assessment of the original surface features on a scaled rendering. The web based display facilitates interactive use, and "on-image" recording of forensic investigation data, e.g. drill resistance testing, ground penetrating radar, impact echo and ultrasonic graphs and data, as well as pre and post damage and post restoration comparisons. The use of the technology to make work scope and forensic data retrievable, accessible, and understandable to the field user is illustrated. Photogrammetric scaled photo-renderings with enhanced surface texture as CAD blueprint substitutes and high resolution photo inspection tool allowing pan and zoom capability is demonstrated to show how greater control can be established for projects, reduce bidder uncertainty, and rely less on artistic interpretation and more on original artist/architect intent in a restoration.

These tools ultimately allow for the evaluation and documentation of the conditions not possible until current development in computing and the internet, leading to a more robust conservation effort, and better longitudinal record of weathering, deterioration, and repair. R. Alden Marshall & Associates, in association with Manassas Consulting, is leading the way in drone aerial HD video and laser documentation that will work in conjunction with the photogrammetric imagery so that surveys of Architecture Monuments and Architectural Art that were previously inaccessible without great expense can now be surveyed and documented at a more reasonable cost.

Emergency Documentation And Condition Mapping of Decorated Historic Surfaces at the Caid Residence, The Kasbah of Taourirt (Ouarzazate, Morocco)

Mario Santana Quintero, Assistant Professor, Carleton Immersive Media Studio, Carleton University; Kenneth Percy, PhD Student, Carleton Immersive Media Studio, Carleton University; Claudia Cancino, Senior Project Specialist, Getty Conservation Institute; Laurie Wong, Project Specialist, Getty Conservation Institute; Benjamin Markus, Project Specialist, Getty Conservation Institute

As it is broadly understood, recording serves as a basis for the diagnosis, treatment and preservation of historic places and contributes to record our built cultural heritage for posterity. This work is not a stand-alone practice but a part of the overall conservation process of cultural heritage at imminent risk of irreversible damage. Recording of heritage places should be directly related to the needs, skills and the technology that are available to the end users that are responsible for the management and care of these sites. They should be selected in a way that the future managers of these sites can also access and use the data collected. This paper explains an innovative heritage recording approach applied by the Getty Conservation Institute (GCI) and Carleton Immersive Media Studio (CIMS) in the documentation of historic decorated surfaces at the Caïd Residence, located at Tighermt (Kasbah) Taourirt in Ouarzazate, Morocco; as part of a collaborative project between the GCI and the Centre de Conservation et Réhabilitation du Patrimoine Architectural des Zones Atlasiques et Sub-Atlasiques (CERKAS) to rehabilitate the entire architectural ensemble. The selected recording techniques were used for the rapid mapping of conditions of the decorated surfaces at the Caïd Residence using international standards. The resulting work is being used by GCI staff, consultants and CERKAS team to conduct emergency stabilization and protection measures for these important decorated surfaces.

Bracing Copan's Subterranean Tunnels Against Hurricanes and Other Risks

Laura Lacombe, Project Field Director, Harvard University, Copan Acropolis Project; William L. Fash, Jr.; Charles P. Bowditch, Professor of Central American and Mexican Archaeology and Ethnology, Harvard University

The Maya site of Copan is Honduras's only cultural heritage site protected by UNESCO. Its Acropolis exemplifies some of the most magnificent constructions of the Classic Maya civilization, consisting of several joined courtyards and temples, and featuring the Hieroglyphic Stairway, the longest hieroglyphic text in the New World. Four kilometers of excavation tunnels beneath the Acropolis have confirmed that the construction of this monument took place over 400 years, encompassing the reigns of 16 named Maya kings. The architecture in the tunnels contains original sculptured, plastered, and painted surfaces that represent the dynastic monuments of the earliest rulers of Copan. The vast majority of the tunnels remain unfilled, despite the fact that their investigation has been concluded. Some have been made available for tourism, and the Honduran Institute of Anthropology seeks to open more, but many are no longer in use and threaten the integrity of the Acropolis should they collapse. In 1997, Hurricane Mitch brought record-breaking rains through the mountainous regions of Honduras, swelling the Copan River nearby and causing water levels to rise up to 73 centimeters in the lowest tunnel levels. The uppermost, final phase East Court, the raised courtyard on the eastern side of the Acropolis, became a watershed with its recently installed waterproof membrane. The concentrated runoff from this membrane caused a four-meter-wide crack to open along the eastern cut of the Acropolis. Following Mitch, minor tunnel collapses occurred in areas associated with runoff patterns from the East Court as well.

Copan's current Site Management plan advises against tunnel backfill. It does not include plans for disaster preparation or outline explicit conservation policies. The site also lacks a comprehensive three-dimensional map of the entire tunnel system. As the Honduran Institute of Anthropology queues up more tunnels to be opened to tourists, it becomes necessary to consider the pending risks as erratic weather patterns continue. Heavy rains and flooding along the alluvial fan of the Copan River Valley could cause further collapse and shifting throughout the Acropolis. The site is also located near an active seismic fault. This fall, a small team will construct a digital three-dimensional model of the tunnel system in order to triage the areas that are the most at risk of collapse, to quantify the areas still in need of stabilization, and to determine the effectiveness of the waterproof membrane below the East Court. This paper will investigate solutions such as backfill and stabilization methods to prepare for future storms or earthquakes, and methods such as air extraction devices and alternative barrier systems as potential mitigations for tourism. It will discuss the importance of monitoring to establish environmental control parameters for cave-like systems, and the difficulties of using data loggers in high-humidity environments. Finally, studying the conditions present in areas currently open to tourists will inform whether a decision to continue opening new tunnels to tourists is, in fact, wise—or whether it is just one more disaster to brace against.

Protecting Stained Glass Windows From Vibrations Caused By Construction Operations

Dean Koga, Director of Technical Services, Building Conservation Associates, Inc.; Erica Morasset, Conservator, Building Conservation Associates, Inc.; Michael Schuller, Consulting Engineer and President, Atkinson-Noland & Associates

The Department of Buildings of the City of New York mandates that Construction Protection Plans be prepared and filed to protect historic buildings from damage caused by construction on nearby buildings. The directive sets a threshold for vibrations, but, in buildings subject to the requirement, fragile objects and assemblies such as stained glass windows require special attention. At Congregation Shearith Israel on Central Park West in New York City, a separate construction protection plan was prepared for the original Tiffany windows. BCA documented the windows' conditions and called for minor repair and precautionary work. Three heavily damaged windows were removed from the site for restoration during construction operations. In lieu of physical interventions to the remaining windows, BCA devised a separate vibration monitoring system mounted directly on the windows to monitor the effects of construction. The monitoring program developed for the project by ANA incorporates a series of triaxial geophones mounted on the vertical stabilization bars at mid height or on saddle bars where no vertical bars exist. The geophones were configured to trigger if the measured peak particle velocity exceeded a preset threshold (well below the levels set for typical building assemblies), and send a series of alarm emails if the displacement recorded during a trigger event exceeded the displacement thresholds. The monitoring program has thus far been highly successful, acting as a reasonable alternative to the standard approach of invasive bracing, or even removal, while leaving the windows fully functional. Periodic checking of the window conditions against preconstruction documentation determined that no damage had occurred. The paper will describe the considerations resulting in the accepted approach. The designer of the monitoring equipment will discuss the design and installation and the specific challenges of working with the historic windows in an active house of worship.

Flash, Flame, and Finishes: Investigating Fire Damaged Architectural Finishes

Stephanie M. Hoagland, Principal, Jablonski Building Conservation, Inc.; Helen M. Thomas-Haney, Principal, Jablonski Building Conservation, Inc.

Fires were common occurrences in the late 19th and early 20th centuries. Open flames from candles, cooking fires, oil-lamps, gas-lamps, coal stoves, cigars and cigarettes, arson, collections of combustible materials, and faulty electrical wiring all led to conflagration. While large fires lead to the total loss of many structures, evidence of smaller fires were often just covered in new wallboard, pressed metal, or simply painted over. Paint archaeology, the comparison of paint stratigraphies on various elements of a historic structure, is an important tool to gain a greater understanding of a historic space including alterations, additions, and changes in appearance over time. Examination of paint samples can reveal evidence of fires in a building's history. Heat and flame damage to the decorative finishes can be seen in cross-sectional analysis as scorched, bubbled, or melted paint, and glazes with a caramelized appearance. While these are obvious visual manifestations of physical changes in the material, are there changes in color or composition of either the pigment or the binder, which are undetected in these targeted finishes?

Previous research on fire-damaged paint has focused solely on the conservation of artistic paintings on canvas. As the actual painted surface of these artistic works is significant and requires salvage, this research concentrated on methods aimed at restoring the surface of the painting, including repairing blistered paint and surface cleaning. Architectural finishes, however, are often treated differently. Frequently, the goal of cross-sectional analysis for architectural finishes is primarily color-matching to facilitate a reasonably faithful recreation of a historic space. However, does intense the heat and flame make accurate color-matching impossible? Research on the effects of fire on architectural painted finishes has been overlooked. This presentation will discuss on-going research to determine if the original appearance of damaged paint in cross-section be deduced. Paint samples and stratigraphies of known composition will be subjected to open flame and high heat at known temperatures commonly found in fires, and then analyzed in cross-section to determine what changes occurred. Treated and untreated samples will be examined under simulated daylight and ultra-violet light to record color change and any physical alterations to the paint layers. Fourier Transform Infrared Spectroscopy (FTIR) will be performed on select layers to determine if any compositional changes occurred to the binders. Finally, pigments in select layers will be examined under polarized light to document any potential changes. Once the changes in the paints have been identified, the challenge becomes, is it possible to determine the original composition and appearance of the historic material? If so, can the changes be reversed? Or, if the changes are consistent, can the color be adjusted by the conservator based on knowledge and experience?

And Now What?: Technical and ethical decision-making process regarding a Parisian 17th-century paintings in the aftermath of a catastrophic fire

Dominique Martos-Levif, Engineer, conservator scientist, laboratoire de recherche des monuments historiques, Ministère de la culture et de la communication; Vincent Detalle, Research Engineer, laboratoire de recherche des monuments historiques, Ministère de la culture et de la communication; Rebecca Rivry, engineer, consulting firm ECMH; Elsa Bourguignon, Engineer, laboratoire de recherche des monuments historiques, Ministère de la culture et de la communication; Isabelle Pallot-Frossard, Director, C2rmf (centre de recherche et de restauration des musées de France)

A few years ago, a dramatic event occurred in a listed 17th-century Parisian "hôtel particulier," a grand mansion townhouse, well-known for the quality and authenticity of its sculpted and painted internal decoration. While the building was undergoing extensive renovation work, a fire started in the attic during the night. This paper focuses on the ethical and technical decision-making process in the aftermath of the fire for a few, very significant, 17th-century painting. These decor, painted in oil on plaster, were severely affected by the fire, the smoke and the water used to put it out. This led to the almost complete collapse of one of the ceilings, while the others were affected but remained in place. Immediately, a collaborative mechanism was put in place between all the stakeholders for discussing the technical and ethical issues regarding the collapse ceiling as they arise. These included the building owner, the architect, the conservators, as well as curators working for the French Ministry of Culture. The conservation team, which had just spent the previous year working on these ceilings, was immediately at hand and intervened within hours. The Laboratoire de recherche des monuments historiques (LRMH), the state conservation science laboratory for historical monuments, was asked to provide scientific and technical support to the conservators. The collapsed paintings was a gigantic puzzle, with some irremediably lost pieces, but the knowledge of the conservators who had just finished its conservation as well as excellent documentation existed. The fire high temperatures had changed some of the original colors and had also an effect on the conservation materials which had just been applied to the painting. Emergency actions were immediately taken: collection of the fragments, installation of a wooden structure to support the soaked part of the ceiling still in place, removal of the wood and canvas wall panels, removal of liquid water, monitoring of the relative humidity and of the potential microorganism development, etc. Once all emergency measures had been taken, selected samples were taken for material characterization and the alterations observed in laboratory. Different replicate samples reproducing the painting layers were made and subjected to high temperatures to better understand the alteration mechanisms. Cleaning tests were carried out by the conservators and evaluated in the

laboratory to establish treatments protocols. Once this technical research carried out, the key issue of the future of this paintings, now in fragments, needed to be tackled, and a decision to be reached by the owner advised by the architect. Technically, the paintings could be reassembled, albeit with lacunae, but should it be replaced in situ? in a museum? And how the lacunae should be treated? Should the painted fragments be left in a museum drawer? In that case, how the new painted decoration should be treated?

Surviving Multiple Disasters: Conserving New York's Telephone Building Murals

Avigail Charnov, Manager of Conservation Services, EverGreene Architectural Arts

In 2001 the Verizon Building, located in lower Manhattan just north of the former World Trade Center site, was significantly damaged by the terror attack of 9/11. The building sustained damage from smoke, soot, drastic fluctuations in temperature, and moisture. Further damage from soot and grit was caused following 9/11 by the proximity of the building to the enormous Ground Zero construction site. In October 2012 the building once again found itself in an unfortunate location as the flood waters of Super Storm Sandy filled the basements and lobbies of the buildings of lower Manhattan. Water reached four feet high in the main lobby of the Verizon Building, fully submerging 3 of 5 of the buildings subbasements. The Verizon Building, originally the Barclay-Vesey Building of the New York Telephone Company, was designed by Ralph Walker of McKenzie, Voorhees, and Gmelin and built from 1923-1927. The building is a New York City Landmark (1999), listed on the National Register of Historic Places (2009), and the lobby interior was designated a landmark by the New York Landmarks Preservation Commission (1991). The lobby ceiling has a wonderful early 20th Century series of 12 murals depicting the progression of communication from early Egyptians with megaphones and Aztec runners to the telephone. The decorative painting was performed by Edgar Williams and the firm of Mack, Jenney, & Tyler. The 12 murals were originally painted free-hand and are considered to be fine art.

The Verizon building underwent an extensive 3-year interior/exterior renovation following the 9/11 attack. Prior to 9/11, the murals had been extensively overpainted—if not completely repainted—in several campaigns, the last of which was executed in the late 1980s or early 1990s. The extent of overpaint visible on the surface was often difficult to clearly define given the deteriorated condition of the mural, adding another layer of difficulty to the conservation work. Additionally, following 9/11, the entire HVAC system for the building, including ducts and vents, had to be cleaned prior to the conservation work to ensure that grit did not continue to blow on the murals. Each extensive conservation project had to be performed while the site was occupied. Following Super Storm Sandy the conditions at the site that required specific treatments included: an unevenly saturated plaster substrate, migration of salts from plaster, complications from previous campaigns of overpaint, varnishes, and dissimilar media as well as blind cleavage between layers and paint instability. EverGreene has conserved the lobby and its murals twice, once after the damage of 9/11 and again after the damage of Super Storm Sandy. Each time, a full condition assessment was conducted, laboratory tests and analyses were performed, and treatments were carried out ranging from drying out the plaster substrate, to consolidation, and the reinstatement of gilding and lost decorative painting. The historic murals in the lobby of the Verizon Building have now undergone two extensive conservation projects and the building presents an interesting study on the significant damage caused to a historic structure by two unpredictable disasters.

Post-Disaster Data Collection: Testing New Tools in Port-au-Prince, Haiti

Erica Avrami; James Marston Fitch, Assistant Professor of Historic Preservation, Columbia University Graduate School of Architecture, Planning, and Preservation; Will Raynolds, Adjunct Assistant Professor, Columbia University Graduate School of Architecture, Planning, and Preservation

Rapidly collecting and processing survey data on the ground is a challenge in any disaster context, regardless of its aim. With response efforts rightfully focused on humanitarian efforts to assist survivors and attend to casualties, it can be particularly difficult to collect data about built heritage, since it is often considered a secondary concern. This was certainly the case in Port-au-Prince, Haiti, after the January 2010 earthquake. While UNESCO, World Monuments Fund, and others assisted in assessing the damage to historic buildings, efforts were challenged by the loss of heritage documentation and professionals in the earthquake, the diminished capacity of local institutions, the lack of accurate maps and cadastral data for Port-au-Prince, and the sheer extent of the structural damage and affected population in and around the city. Efforts to rapidly collect conditions information for historic resources did not prompt a level of local preservation action that was as immediate, pervasive and sustained as hoped. Five years after the earthquake, recovery continues. Now more than ever, the lack of basic information regarding the relationship between historic resources and the surrounding city impedes local efforts to match limited funding with worthy conservation projects.

With this in mind, a quarter of Port-au-Prince that is characterized by more than 200 turn-of-the-century Gingerbread houses is serving as an experimental model for a graduate studio at Columbia University that involves students from its masters programs in historic preservation, urban planning, and real estate development. The students are using open source software developed by the Harvard Humanitarian Initiative to test rapid survey methodologies and tools, building the most comprehensive urban conditions survey to date for this wide swath of the

city. While designed to function in the challenging environment of post-disaster contexts, the application is not specific to heritage or architecture, but is highly adaptable and customizable. A critical aspect to this effort is the open source nature of the software and its capacity to collect data offline (without a data connection), making it ideal for disaster contexts and readily accessible by users on the ground. Through testing in the United States and during fieldwork in Haiti, this research will provide an evaluation of the challenges and opportunities the use of such technologies present in post-disaster heritage surveys.

Monitoring Cultural Heritage in Conflict Using Remotely Sensed Imagery: Syria

Dr. Susan Wolfinbarger, Project Director of the Geospatial Technologies Project, American Association for the Advancement of Science

The growing availability of high-resolution commercial satellite imagery provides unprecedented capabilities for monitoring around the world, shedding light on events in remote locations. The ability to monitor remotely is of particular need when conflict creates non-permissive environments that result in long-term inaccessibility on the ground. Multiple actors often overlap in space and time and conflicting accounts, often based on incomplete or inaccurate information, can proliferate. When conducted with a rigorous study design, proactive monitoring of cultural heritage sites, utilizing time-series historical analysis, can bring much needed clarity to these situations by providing independent scientific assessments of past events or events in progress. This presentation will discuss the methods and means being used to systematically monitor cultural heritage sites in Syria using high-resolution satellite imagery. The research identifies and quantifies damage to cultural heritage sites and has developed a method to determine risk to sites based upon a wide variety of geospatial factors, ranging from local military presence to site accessibility. The difficulties encountered while conducting large-scale satellite imagery analysis will be discussed, such as identification of corroborating information, data storage and organization, workflows, and coordinating multi-analyst research.

Preservation for a Digital Future: Using Laser Scanning to Protect Pompion Hill Chapel, Huger, South Carolina

Jane Ashburn, Intern; Warren Lasch Conservation Center with the Clemson University Restoration Institute; Amy Elizabeth Uebel, Architectural Conservator, Warren Lasch Conservation Center with the Clemson University Restoration Institute; Andrew Spitzer, Warren Lasch Conservation Center with the Clemson University Restoration Institute

From hurricanes to floods to earthquakes, the Lowcountry of South Carolina's historic built environment is under constant threat from natural disasters. Situated on the banks of the Cooper River, Pompion Hill Chapel, constructed in 1763, has withstood centuries of assaults from the natural world, aided in part by a sequence of conservation interventions and reconstruction periods. This study highlights the most recent disaster preparedness effort undertaken by the Warren Lasch Conservation Center (WLCC) at the Clemson University Restoration Institute in North Charleston, South Carolina, through a digital documentation and conditions assessment process intended to develop a system of routine documentation to monitor the effects of the environmental and geological actions. When erosion began taking parcels of the Chapel land into the river, rip-rap was installed as a mitigation. The system slowed attrition, but shifted the surrounded soil's moisture equilibrium. The installed rip-rap allowed moisture to escape from the clay heavy soil at a faster rate. As the clay hardened, the differential settlement of the soil caused the structure to crack. An intervention in the late 20th century addressed the settlement and cracking issues by creating a mechanized system to keep the clay heavy soil saturated at limits that would lessen the effects of soil movement. At the same time, a new roofing system was installed to support the original timber beams that had begun to sag under the weight of the slate shingles. While traditional hand-measured drawings exist for the site, these documents are limited and do not fully document the changes and alterations of Pompion Hill Chapel. In order to help mitigate and monitor future and past interventions, conservators and architectural historians from WLCC worked to create a comprehensive conditions record of the structure, cemetery, and surrounding landscape. It was determined that a campaign that combined laser scanning and comprehensive field and archival research would provide the owners (who privately own the structure) with a working document that balanced high accuracy, reasonable cost, and would create a set of workable documents. As this project enters its subsequent phases, the 3D documentation (including the associated metadata) will be used to create a long-term monitoring program using future campaigns of 3D imaging. Conservators will return at specific intervals to highlight areas of concern to determine deflection, settlement, and the impact of the changing environment on the structure. This documentation not only provides an accurate as-is model necessary in the creation of a successful disaster management plan but also allows for subsequent assessment to track the impact environmental action has on the structure and allows for intervention before further (and more costly) damage occurs.

An Investigation of the Painted Finishes of Mission San José de Tumacácori's Façade: At the Interface of Materials Analysis, Conservation, and Cultural Confluence

Jocelyn Chan, Student, University of Pennsylvania, Integrated Conservation Resources, Inc.

Located near Tucson, Arizona, the Mission San José de Tumacácori is a Spanish Colonial mission and the primary landmark of significance within the Tumacácori National Historical Park. Begun around 1800 and acquired by the National Park Service as a half-completed ruin in 1916, successive campaigns of repair have stabilized but also obscured much of the original surfaces of its once brilliantly painted church façade. With the support of the National Park Service, Penn's Architectural Conservation Laboratory is currently examining the original façade through thesis work that encompasses archival research, comparative studies, in-situ investigation, laboratory analysis (optical microscopy, fluorescence microscopy, SEM-EDS, instrumental analysis, and gravimetric analysis), and conditions assessment.

Through the development of North American missions, the Jesuits were decidedly influential in shaping the expansion of New Spain during the colonial drive of the Spanish empire. However after the Jesuit expulsion of 1767, the missions were inherited by the Franciscans, and in 1848 soon entered a period of overall decline until National Park Service superintendent Frank Pinkley initiated preservation in 1918. Pinkley's interventions thus began a tradition of preservation at Tumacácori that would later guide much of the philosophy and history of architectural conservation in the Southwest.

Indeed, Tumacácori's façade can be read as a document in itself that communicates the development of American preservation philosophy for almost 100 years. Originally covered in polychromatic painted lime plaster, significant decorative finishes can be found in protected areas and approximately 155 square feet of historic plaster currently remains on the exterior. Under Pinkley's stewardship, conservation methodologies were experimental and would eventually give rise to the use of traditional building materials and methods as a form of repair. In contrast, between the 1940s and 1970s, synthetic resins and non-traditional treatments of grouts, water repellents, and consolidants were heavily employed. By studying the application of these methods in succession, one can gain a perspective of nearly a century's worth of preservation thinking and insight into the development of architectural conservation and historic preservation in the United States.

Therefore this analytical work will inform the foundation for a pilot conservation program to conserve the fragile exterior finishes and develop new interpretive content on the design, construction and evolution of the exterior. Furthermore, the project will be highlighted in the National Park Service's centennial in 2016 by examining the conservation history of Tumacácori's celebrated church as an illustration of past and present preservation methodologies and site management. Indeed, the façade of the Mission San Jose de Tumacácori represents an exemplary case in which architecture, preservation, and conservation technology converge to reveal the complex history of the church and its present condition – ultimately representing the confluence of Native American, Spanish, Mexican, and Euro-American culture, religion, settlement, and politics.

Zion Chapel of Ease Cemetery: Present Communication of Past Devastation

Anna Lindamood, Student, Savannah College of Art and Design

The Zion Chapel of Ease Cemetery is located on Hilton Head Island, South Carolina, which was once the amongst battleground of the Revolutionary and Civil Wars. This site was directly involved in the exchanges between the English and, later, the Union because the site was located in the center of social happenings on the Island during the time. The Zion Chapel of Ease (c. 1786) once existing on the site but was desecrated by freed men following the Civil War. All that remains on the original site are the gravestones and one large Greek Revival mausoleum from the church cemetery. The predominate Antebellum Hilton Head families were buried in the cemetery as a means of communication of their status in the community. The Baynard Mausoleum (c. 1845) is the oldest extant structure on Hilton Head Island and is in need of major repair. The sandstone slabs, which make up the exterior, are targets of moisture and show signs of efflorescence. The limestone roof slabs have slid down due to wooden interior roof beams deteriorating. This process has left the interior exposed to the area's subtropical humidity and moisture accumulation. Even age and valor cannot fully protect this site and the rich cultural heritage tied to the place. The Baynard Mausoleum and substantial family plot, which includes the both the Kirk and Davant families, has been vandalized by both man and natural elements continuously for over nearly 200 years. The site sits at the corner of a major passage through the island without protection of a fence or security of any kind. As if nature wasn't enough of an enemy for the Zion Chapel of Ease Cemetery, vandals have created devastation by dismantling the cast iron fencing around the family plot and mausoleum, dislocating gravestones from their original positions, and pillaging the cast iron coffins from the Baynard Mausoleum. Restoration and conservation work on the site has been slim due to funding and lack of knowledge on the historical significance of the site. Hilton Head Island has evolved to become a resort town primarily, ranging in population throughout the year but rising in residents during the summer months. Concentrations of people desperately care about safeguarding and conserving the site to honor the notable architecture, funerary artwork, and history of the site for future recognition of its cultural heritage for later generations. With the efforts of its current owner, the Hilton Head Heritage Library, the cemetery is currently undergoing the nomination process for the National Register of Historic Places. The research of this abstract includes executional protection of the gravestones on the site, the future conservation repair of the Baynard Mausoleum, and the restoration of the cast iron fences on the site. The intention is noting the importance of the site to South Carolina and regional history and developing a conservation plan for the pristine examples of funerary artwork and architecture from the mid-19th century.

Performance Assessment and Evaluation of Hydrophobic and Ultraviolet Protective Treatments for Historic Log Structures

Courtney Magill, Student, University of Pennsylvania

This paper focuses on the evaluation of the durability of traditional and modern hydrophobic and ultraviolet (UV) resistant treatments for historic log structures such as those found at the Bar BC Dude Ranch in Grand Teton National Park, WY. These treatments are being evaluated on a variety of criteria including performance in accelerated and natural weathering testing, ecological sustainability, and impact on aesthetic and heritage character. The testing was performed at The Architectural Conservation Laboratory (ACL) at the University of Pennsylvania in cooperation with the National Park Service and the Western Center for Historic Preservation (WCHP), and the University of Wyoming. Natural weathering is currently being conducted on site in Grand Teton National Park, having been set up in early August for an initial year-long testing period, in order to verify lab results and develop a treatment protocol for local log structures that will preserve original fabric while maintaining intended aesthetics of the buildings. Like many log structures in the American West, the Northwestern National Park Region's historic structures are exposed to a large amount of UV radiation due to high elevation. In addition to degradation mechanisms delineated from contact with water, the physical fabric of wood is damaged by UV light through degradation of lignin, essentially the glue that holds the cellulose fibers together. Small depth of penetration restricts damage to surface area. However, when combined with shrinkage and swelling of water sorption or abrasion from weathering, surface material delaminates, exposing untreated surfaces for further delignification. This process is very slow but causes a steady loss of original fabric on historic log structures. Accelerated weathering was conducted in Spring of 2015 using a QUV Weatherometer at the ACL which simulates weathering by subjecting samples to cycles of UVB ultraviolet light, heat, condensation, and water spray. While artificial weathering occurs in more intense, concentrated cycles than those in nature, results can be an indicator of longer-term performance of the treatments and the substrate. Five modern and two historically-used treatments were tested on new samples of lodgepole pine (Pinus contorta latifola), a common building material in the area. Samples were evaluated using a range of methods including weight change, surface degradation, color changes, changes in water repellency, and FTIR in an effort to determine performance during testing. A natural weathering rack was designed and constructed on site in the summer of 2015 in order to verify or deny results found in lab testing. Both weathered and new samples of lodgepole pine logs were treated with those treatments that performed well in accelerated weathering and were fixed in place on the bracket after being evaluated for starting weight, color, surface appearance, and water repellency. The weathering period will continue for a year, a full cycle of seasons, before extensive evaluation, but color measurements and photographs are being taken at intervals during the process. The combined results of the lab and field testing programs can inform the Park's conservation and maintenance program for the many historic log structures in their care.

Color Me Interested: Identification of Pigments in Early Trade Catalogues

Corey Manchenton, Graduate Student, Columbia University

What can early paint trade catalogues tell us about the beginnings of the commercial paint industry? Trade catalogues were originally produced advertising materials, but are now becoming a non-traditional tool for period architectural paint research. In order to garner the interest of the American consumer, paint manufacturers produced catalogues to promote and showcase their products. To do this these catalogues often used scenes depicting designs using their products, testimonials, or a collection of samples mounted inside. Many paint trade catalogues contained actual samples of the manufacturer's products, likely similar to those being sold to consumers. These catalogues were tested to understand the use of pigments as the paint industry developed in the late 19th and early twentieth century, leading to interesting and previously unknown findings about the paint industry during this period. The study of commercial architectural paints is in its infancy, as most studies are focused on fine artists' paints and hand-mixed architectural paints. The research described in this paper begins to fill the hole in architectural paint research by using paint catalogues produced between 1870 and 1914 to test and identify the pigments used, looking to see if and how the use of pigments changed as the paint industry developed. For this research, over 50 period paint catalogues, containing nearly 1,500 samples and spanning almost 20 companies, were tested. This examination involved the technical analysis of the pigmentation present in the samples using a variety of methods, including Fourier transform infrared spectroscopy (FTIR), X-ray florescence (XRF), and polarized light microscopy (PLM). This testing was done not only to identify the pigments used, but also as an analysis of the testing methods for this particular type of investigation. The different strengths, advantages, and disadvantages of each test was noted, as different tests achieved different quality and types of results, with some tests being much more effective at gathering certain types of data than others. The analysis of these samples revealed unexpected and fascinating results that would not have been achieved without a sampling of this size, showing sweeping similarities across the paint industry that had gone hitherto unnoticed as the paint industry developed into the large commercial enterprise that exists today.

The Rationale for Rebinding at the Pierpont Morgan Library in the Early Twentieth Century: A Case Study

Saira Haqqi, Graduate Conservation Intern, Weissman Preservation Center, Harvard University Libraries

In the United States, scholars rarely see manuscripts and incunabula in their original bindings. Most texts in American rare book collections have been rebound at least once, if not many times, between the time they were created and the present day. Rebinding is therefore an important point to consider in the study of these objects. When and why did it occur? How were decisions made, and who made them? What informed the practice of rebinding? This paper attempts to contextualize the practice of rebinding in the early twentieth century in America – a time when American collectors were particularly interested in the acquisition of rare books – by using the rebinding practices at the Pierpont Morgan Library in New York (now the Morgan Library & Museum) as a case study. From 1908 until 1958, much of the rebinding work for the Morgan was carried out by one person – Marguerite Duprez Lahey (1880-1958). Duprez Lahey, born in Brooklyn to a well-to-do family, took up bookbinding as a hobby at the turn of the twentieth century. She studied under several French bookbinders and finishers before beginning her employment at the Morgan. Despite being widely hailed at the time as the best bookbinder in America, she did not receive formal apprenticeship training and from today's viewpoint, many of her bindings are idiosyncratic and problematic. A study of the Morgan archives reveals that Duprez Lahey was not the sole decision maker in rebinding manuscripts – John Pierpont Morgan (1837-1913) and his son, John Pierpont (Jack) Morgan, Jr., (1867-1943) as well as Belle da Costa Greene (1883-1950), the Morgan's first librarian and director, played active roles in the eventual fate of the books. Their decisions, in turn, were influenced by aesthetics, a possible concern for durability, and the way in which best practices were understood at the time. Conservation is a very young field, and book conservation is an even more recent development. At the time Duprez Lahey was practicing, conservation ethics were not yet codified. The practice of rebinding rare books had not received the depth of attention that it has today. As such, Duprez Lahey's work was necessarily limited by the knowledge available to the binder and her employers.

While a lack of documentation makes it difficult to determine exactly why specific books were chosen for rebinding over others, or why certain books were bound in certain styles, an examination of rebinding practices at the Morgan during the first half of the twentieth century offers a glimpse into practices in a library at the forefront of the book world at the time. It provides a new understanding of the relationship between bookbinder and collector, the various influences (artistic and economic) on bookbinders, and the aesthetic values of the collectors of the era. This paper grew out of research conducted for a Master's thesis in Art History at the Conservation Center of the Institute of Fine Arts at New York University (NYU). It was sponsored by NYU and the Andrew W. Mellon Foundation.

You wanted WHAT, WHEN? An Issue of Scale: Delivering high end treatments on a large collection of illuminated manuscripts

Debora D. Mayer, Helen H. Glaser Senior Conservator, Weissman Preservation Center, Harvard Library; Alan Puglia, Senior Book Conservator, Weissman Preservation Center, Harvard University

Senior conservators at the Weissman Preservation Center (WPC) at Harvard University routinely establish protocols for the treatment of large collections and projects. These protocols are designed to integrate expert skill and techniques, provisions for quality control, and an efficient workflow. This talk will provide an overview of the guiding principles for best practices in the treatment of large collections, focusing on the consolidation of friable media in over one hundred and fifty medieval manuscripts requested for loan to a multi-venue exhibition. This protocol is rigorous and includes detailed instructions that define procedures used to evaluate, treat and document the consolidation of the media. The current work flow involves up to ten conservators using two fully equipped microscope stations.

Our protocol ensures uniformity in treatment procedures and judgment. Consensus is critical when more than one person works on any project and is an essential component on large group projects involving many conservators. We have learned that the quality of treatment and the degree of uniformity are substantially greater when multiple conservators collectively agree and follow the same guiding principles. This approach goes beyond procedural processes – it aligns decision making and judgment.

The result of having all conservators follow the same protocol gives the appearance that one person treated the entire collection. Best practices are achieved through collective and collaborative understanding. The process of developing the protocol requires extensive discussion, being open minded, sharing observations and suppressing ego. A team approach (of two or more people) is essential to help ensure the development, refinement, and execution of best standards of practice. Finally, it is extremely important that the quality of the work be uniformly high throughout the entire treatment project. And by sharing the work load, large quantities of high-quality work can be performed without burn-out and in a reasonable time frame. The presentation will discuss the details of the equipment set up and procedures used to evaluate and treat friable media in illuminated manuscripts. This includes cradles, tools for evaluating media friability, working magnification for examination and treatment, the judgment of when and when not to treat, methods of consolidation, the system for verifying that treatment was successful, and the method of digital record keeping.

All Over the Map: Bringing Buffalo's Stars of Cartography to Light (One Lining at a Time)

Stephanie Porto, Owner and Paper Conservator, Niagara Art Conservation

This paper presents the conservation of eight rare maps of the city of Buffalo in the collection of the Buffalo and Erie County Public Library. The project was funded by a New York State Discretionary Grant and highlighted in a recent exhibit in the library's Grosvenor Rare Book Display Room entitled, "You Are Here: Buffalo on the Map" (http://www.buffalolib.org/content/now-display/rare-book-room/buffalo-on-the-map). The conserved maps collectively depict the growth of Buffalo, New York, from village to town to bustling city between the years 1805 and 1909.

The maps in their pre-conservation state ranged in size and structure, from a 7 x 9 inch engraved map mounted to acidic board to a nearly 3 x 4 foot hand-drawn map lined twice with cloth; however, they shared a generally poor state of preservation resulting from natural aging and use in combination with improper housing. Condition issues included overall discolouration and embrittlement, staining, delamination and loss, tears and inappropriate previous repairs, darkened surface coatings and aged backings. Several of the maps were stored folded and could not be opened up for viewing without risking significant further damage through handling. While the original treatment plan outlined in the grant proposal described a complete restoration of the maps, plans had to be scaled back due to an unfortunately late notification of the library's award and a drastically reduced timeline for the work. In addition, unforeseen developments during treatment necessitated multiple reassessments and changes to the already modified treatment proposal. Six of the eight maps required linings to strengthen the weak paper supports, but traditional paste linings were not feasible in several instances due to unexpected sensitivity of media as well as poor quality papers that were compromised by water damage and mold. Two of the maps were so fragile that backing removals were deemed too risky, and the new linings were carried out over the existing cloth backings.

In the interest of balancing the preservation needs of the maps with the need for economy of time and materials, a dry lining technique using toned heavyweight Japanese paper and a heat set film of Lascaux 498 HV and 303 HV adhesive was developed to simultaneously stabilize the maps and compensate for loss. This technique was applied, with slight modifications, to five of the maps. The treatment of one of the maps, "Map of the City of Buffalo" (1833), including a detailed account of the lining process, is discussed in depth.

Recent Conservation Treatments of Portrait Miniatures at Library and Archives Canada

Doris St-Jacques, Paper Conservator, Library and Archives Canada; Maria Bedynski, Senior Paper Conservator, Library and Archives Canada

Portrait Miniatures present interesting challenges to conservators, as the materials used for substrates, media and encasements vary significantly, as do the techniques used by artists to create them. The portrait miniature collection at Library and Archives Canada (LAC) includes over 130 portraits.

Since 2003, LAC has invested in the development of in-house expertise in the conservation of portrait miniatures. In 2015 a new survey of LAC's portrait miniatures collection was conducted by conservators with several goals; to include newly acquired portraits, to address any outstanding items requiring conservation treatment, monitoring or additional preservation care such as re-housing or frame repair and to be used as a tool for succession planning. This paper will focus on the subsequent conservation treatment of several miniatures on ivory. Case studies will be presented, covering a variety of conservation procedures including; opening and cleaning the miniatures, mould removal, consolidation of flaking paints, humidification and flattening of warped ivory, repair of cracked or broken ivory supports and the often lengthy process of acquiring and replacing a missing or broken cover glass.

Treatment of a Terrestrial Cary Globe

Janet Mason, Conservator (retired), Canadian Conservation Institute; Sherry Guild, Senior Conservator (retired), Canadian Conservation Institute; Joanna P. McMann, Assistant Conservator, Prince of Wales Northern Heritage Centre

Over a two year period ending in 2013, the Canadian Conservation Institute (CCI) treated a pair of globes made in 1835 by John and William Cary who manufactured globes in London UK in the late 18th and early 19th centuries. The globes were constructed from papier mâché and plaster, supported internally at both poles by a wooden pillar. Each globe was suspended within a brass meridian ring with the ring mounted in a wooden floor stand with a horizon ring. This presentation focuses on treatment of the terrestrial globe that sustained damage during a fall from a window. Impact upon landing had forced the central pillar of the globe to move, pushing the sphere out at the North Pole and pulling it in at the South Pole. Extensive cracking, with losses of paper and plaster at both poles, had been repaired prior to the mid 1970's with a generous application of polyvinyl acetate adhesive. An area of plaster loss, where the papier mâché foundation was indented, had been filled with thick plaster. Some varnish removal had been attempted with unknown solvents, resulting in loss of colour where cleaned and discolouration at each side, below the varnish. Following the mechanical and solvent removal of the discoloured varnish (colophony) and old

PVA adhesive, the large plaster fill was removed, allowing for the insertion of a small video camera to inspect the central wooden pillar and the interior surface of the globe. It was decided not to remove the paper gores, but to locally reduce staining and discolouration via poulticing. Conservators tested and used Gellan gum as a controlled means of cleaning specific areas.

In order to access and treat the cracks and losses to the plaster sphere, sections of the paper gores were lifted and rolled back. Distortions to the sphere were re-shaped as much as possible at the poles to create space between the sphere and meridian ring so the globe could move freely. Gore fragments were salvaged, treated and re-adhered to the globe. Losses to the paper gores were infilled with toned paper and digitally printed paper, inpainted, and then sized with multiple coats of gelatin. Six varnish resins were tested and the selected varnish of B-72 was applied via sprayer. Finally, reproduction hour dials, made from digital images of those from the celestial globe, were added to the terrestrial globe. The globe was re-assembled with the south point of the meridian ring placed at the North Pole in order to allow the still slightly distorted sphere to fit within it. A brass disc was placed at the base of the recess in the meridian ring that holds the south pivot to keep it as high as possible and create needed space between the globe and meridian ring.

Careful Consideration: Learning to Conserve a Kashmiri Birch-bark Manuscript

Crystal Maitland, Conservator - Works of Art in Paper, Canadian Conservation Institute

Acknowledging that treatment of any artefact requires nuance, this paper will examine how and why conservators make treatment decisions for particularly unfamiliar or unusual artefacts. The AIC Code of Ethics and guidelines for practice calls the conservation professional to "practice within the limits of personal competence and education;" similarly the CAC/ACCR Code states that the "conservation professional shall recognize his or her limitations and the special skills and knowledge of others." As such, how do conservators ethically tackle the treatment of an entirely new (to us) or rare substrate? When do we judge ourselves to have sufficient competence? Through the lens of a case study of a paper conservator's treatment of a codex form Kashmiri birch bark manuscript, this paper will examine the evolution of treatment decisions demonstrating the challenges, successes and uncertainties of treating an entirely unfamiliar material.

Birch bark as a manuscript substrate, while not normative for western book and paper conservators, has a long tradition in other parts of the world, particularly in the Himalayan regions of the Indian subcontinent. During a high point of Indology and western Sanskrit scholarship at the turn of the 19th century, representatives of this manuscript corpus made their way into the libraries, archives and personal collections of North America and Europe. These artifacts now present many challenges of preservation, storage and access to their stewards.

This case study will address the treatment of 176 approximately 7" x 10" leaves, folded in nine folios, and written in carbon black ink on the naturally and artificially laminated structures of the inner bark of the Himalayan birch. The conservator's basic toolkit of literature searches, in-lab simple material testing and consultations with colleagues are all demonstrated to be key in arriving at "an answer" for treatment, and indeed in deciding that treatment was the proper course for this rare artefact.

A Technical Exploration of a 19th Century Qajar Artists' Album

Penley Knipe, Philip and Lynn Straus Conservator of Works of Art on Paper, Harvard Art Museums

In 1960 the Harvard Art Museums acquired a 19th century anonymous Persian album comprised of sketches, designs, finished drawings, manuscript pages, and miscellany. The album had never been closely studied, despite the fact that it is one of the richest resources of its kind known today from the Qajar period. The 57 folios hold 141 varied works on paper, arranged singly and in groups. Many of drawings were apparently used by artists to make objects in different media, such as lacquered pen boxes. This is evidenced by the fact that a significant number of the drawings bear signs of being used as models such as pricking.

This presentation will focus upon the papers in the album. The author was struck by their diversity and by the fact that most of the papers in this Qajar album are European. These papers provide much needed information about the album. They help group works and they provide information on dating, origins and assembler. A second area of interest for this presentation is the varied methods of transfer represented in the album, such as pricking, pouncing, rubbing and a transfer drawing technique. The album's numerous transfer types led to explorations in the Materials Lab, a purpose-built hands-on space at the Harvard Art Museums where the students practiced pricking, pouncing and related forms of image transfer to better understand what they were looking at and how the drawings might have been used.

The Qajar album will be shown in two years in an exhibition at the Harvard Art Museums. It was, thus, the subject of a graduate seminar last spring that the author helped teach. The seminar was intensively object-based and examined the album from numerous perspectives. The author led two sessions, one on media and one on paper, and sat in on the rest of the course, weighing in on physical characteristics and material issues as needed. This proposed presentation for AIC will focus on what has been learned through careful study of the papers and the various transfer techniques as well as the critical nature of hands-on practice and teaching with real objects.

Watercolor Pencils: Composition and Conservation Concerns

Rosaleen Hill, Director, Art Conservation Program, Queen's University; Lauren Buttle, Paper Conservator, Queen's University; Laura Hashimoto, Queen's University; Natasa Krsmanovic, Assistant Conservator, Queen's University; Kaslyne O'Connor

Within the last century watercolor pencils have become established as a multidisciplinary artist's' medium. Watercolor pencils can be used wet or dry to achieve a multitude of colors, textures, and artistic effects. Little information is available in the art conservation literature with regard to their general composition, ageing characteristics, or the risks associated with their treatment. In order to be able to expect a successful treatment, with no pigment reduction or bleeding, the unexpected and potentially destructive solvent reactions of these pencils must be known. This work examines the composition of a variety of commercially available brand name artist's watercolor pencils (from Derwent®, Staedtler®, and Reeves®), and the reactions of the pencils to solvent immersion, on both artificially aged and unaged samples. Colorimetry and Fourier Transform Infrared (FT-IR) Spectroscopy was used to quantify any fading or material loss throughout the experiment. Despite many similarities to traditional watercolor paints in how they are used, the pencils differ greatly in composition. With analysis, all the watercolor pencils tested here were to found to contain colorants, clays, a polysaccharide binder, and polyethylene glycol. Aging was found to lower the effects of water; while ethanol and acetone had little reaction with the materials both before and after ageing.

Paper Tapestry: Wallpaper Preservation

Joanna P. McMann, Assistant Conservator, Prince of Wales Northern Heritage Centre

From 1866 to 1982, Spadina Museum: Historic House & Gardens was home to four generations of the Austin family. Opened to the public as a museum by the City of Toronto in 1984, Spadina Museum is one of ten historic museums operated by the City of Toronto. Toronto's Economic Development and Culture division decided to update the original restoration of Spadina Museum commencing in 2009. After extensive interior renovations to depict how the Austins lived during the 1920's and 1930's, it was reopened to the public in 2010. The first and second floor renovations included digital reproductions the wallpaper based on original source material maintained in the Austin family's records. That restoration project was presented at the 2011 CAC Conference in Winnipeg. This paper picks up where that one left off. In 1912/13, the Austin family added a third floor to their Spadina home which included servant spaces. The third floor was not included in the previous restoration activities. In 2012, in preparation for opening the third floor servants' quarters to the public for the first time, Spadina Museum undertook the in situ stabilization and treatment of the wallpaper in the servants' hallway, believed to be original to the 1912/13 renovation. This space shines on a light on "the other half" of life at Spadina allowing visitors to now see the servants' living quarters, including the bathroom and water closet, a bedroom and the servants' sitting room, all of which are accessed by a hallway decorated with tapestry inspired wallpaper. The space was also the site of a travelling exhibit featuring costumes from the popular television series "Downton Abbey."

Prior to the 2012 renovation, the servants' space was being used by museum staff as a storage area and had been renovated to incorporate an elevator. As a result, the wallpaper suffered physical damage from items being moved through the space and from construction related activities. Damage included numerous small losses and abrasions to the wallpaper; areas where the paper was delaminating from the walls; and other areas of significant large losses. Additionally, there were water stains from previous ceiling damage, and tears in the wallpaper due to cracks in the lathe and plaster structure it was pasted to. The wallpaper was further obfuscated by a buildup of decades of soot, dust and grime. A different approach was taken with the restoration of the servants' quarters. The original wallpaper was preserved by modifying traditional conservation techniques to clean and treat it in situ, whereas the large losses were infilled with full scale digitally reproduced wallpaper. This paper will discuss the challenges of undertaking this treatment in situ and those of colour matching and achieving the correct scale, proportions and perspective for the digitally reproduced paper, as well as working as an independent contractor with staff and volunteers at the historic property and other City of Toronto divisions and private" partners". This project highlights an emerging approach and modality in conservation and tells the next chapter in the renovations at Spadina Museum.

A Low-Oxygen Capable Storage and Display Case for the Proclamation of the Constitution Act & Design of a Counterbalance Supporting Mount for the Books of Remembrance

Eric Hagan, Conservation Scientist, Canadian Conservation Institute; Michael Smith, Collection Manager, Library and Archives Canada; Anne Maheux, Head Conservator, Art on Paper, Maps and Manuscripts, Library and Archives Canada; Christine McNair, Conservator - Books / Textiles, Archaeology, Objects and Paper, Canadian Conservation Institute

Two versions of the Proclamation of the Constitution Act, 1982, the foundational document which gives Canada political independence and sovereignty from Britain, are held at Library and Archives Canada (LAC). These important legal documents are commonly differentiated as the "raindrop" and "red-stain" copies due to characteristic water markings from the outdoor

ceremonial signing, and the deliberate 1983 activist defacement of the second copy respectively. Increased requests for long-term loan and display of The Proclamation have prompted the need for a suitable multi-purpose case for storage, transport and display. Unfortunately, recent micro-fade testing (MFT) of the signature inks at the Canadian Conservation Institute (CCI) has indicated that the synthetic dyes in the fountain pen inks are very light sensitive. The national significance of the documents, combined with the fugitive nature of the inks, has led to the difficult but common challenge of balancing preservation and access. In the past, traditional methods have been applied such as filtering UV, lowering light levels, reducing exposure time, and limiting the cumulative light dose to an accepted rate of damage. The use of a low-oxygen environment has also been investigated as a possible method for slowing the ink fading during periods of light exposure.

To address both preservation and security requirements for the loan of the documents, a two-part case system was designed: an inner preservation storage case that can be installed in a larger display case that satisfies security requirements. Two identical custom-manufactured cases to house each copy of the Proclamation were recently constructed through a collaborative project between LAC and CCI. During the case design process, light fading experiments were also performed on related ink materials under ambient and low-oxygen environments. The low-oxygen environment showed promise for slowing the rate of fading; therefore, the cases were subsequently developed with the potential for maintaining anoxic conditions for the duration of a typical loan. A particular challenge was accomplishing the design specifications, while also minimising the associated cost.

The finished product incorporated simplified elements from related work at the Getty Conservation Institute (GCI), and the National Institute of Standards and Technology (NIST) in the United States. The history of the project will be presented along with an overview of the case design elements. The Memorial Chamber on Parliament Hill holds seven books of remembrance, which commemorate those that fell in the service of Canada during war and other conflicts. The books are on permanent display to the public, and the presented pages are changed throughout the year during the Turning of the Page Ceremony. A set of six new altars was recently crafted for the books using stone, bronze and glass construction to replace the former wooden version. A condition assessment was performed at the onset of the project by staff at the Canadian Conservation Institute (CCI), to determine the current state of the books and the best approach for their preservation. As part of this assessment, it was recommended that the new altar design should incorporate some form of adaptive support to reduce strain on the bindings. The continual changing of the book position, combined with the need for minimal interruption during The Turning of the Page Ceremony, presented a unique design challenge for mounts. The altar for the First World War book was not modified during the altars replacement project due to its historic significance and high level of craftsmanship. It also contains a unique counterbalance support system, which was the inspiration for a modern version that was designed at CCI to support the remaining books on the new altars. A low profile mount was developed using custom-machined aluminum components that incorporated a series of parallelogram linkages to form a 'gravity-activated' mechanism. This system was used to closely match the natural motion of the book during presentation of the first to last page with minimal adjustment required. For this specialised approach to work, it was necessary to adapt the dimensions of each mount to the geometry and detailing of the individual books.

Push Pins, Staples, Daylight, Glazing and Barrier Free: Are conservation standards becoming too relaxed?

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

Using past and recent case studies this presentation will discuss the preparation, presentation, installation and storage of oversize contemporary art on paper in the context of past and current challenges. These include artist and curator expectations, the impact of tightening health and safety standards, increasing framing and material costs, storage challenges, loan processes, budgets and longer exposure periods. How are these pressures, if at all, impacting and shaping the future direction of conservation decision making and enforcement of standards?

The Coptic Binding Collection at the Morgan Library & Museum: History, Conservation and Access

Georgia Southworth, Independent Book Conservator, Georgia Southworth Conservation; Francisco H. Trujillo, Associate Book Conservator, The Morgan Library and Museum

The Morgan Library & Museum (ML&M) houses the largest single cache of Coptic manuscripts and bindings in the world. The manuscripts were discovered in a hidden well, intact, but in a deteriorated state, in the Fayyum Oasis near Hamuli, Egypt in 1910. This presentation discusses the history of these over fifty manuscripts from their discovery, through the recent initiative to digitize the bindings and provide safe, accessible housings for the collection. The talk will include the discovery and purchase of the collection, the conservation of the manuscripts at the Vatican, and their eventual return to the Morgan Library. The conservation treatment decisions and their consequences for the bindings will be discussed. The physical condition of the 9th and 10th century bindings will be detailed, as will the rationale for the special housings created for them. A century after their discovery, the digitization and re-housing efforts have provided access to a previously inaccessible collection.

A Protocol to Conserve Glazed Paper after a Water Damage

Lucile Dessennes, Paper conservator, Bibliotheque nationale de France

Following a water damage in the Art and Literature Department at the Bibliothèque nationale de France (BnF), the question came of how to handle the wet glazed papers. The company in charge of freezing and drying the damaged documents was reluctant to take care of them because the quantity of water that impregnated each document was very variable. They knew from previous experience that if glazed papers were not totally soaked with water, the sheets would stick together and freeze-drying would have essentially no effect. As a consequence, we have to find a way to separate the sheets of glazed paper stuck together. We investigated the composition of the glazing, and found that most papers were glazed with Styrene-Butadiene latex. One of the solvents of SB latex is Tetrahydrofuran (THF). THF is toxic, but it can be replaced with a mix of ethanol and toluene (50/50 v/v). Tests were carried out on a sample of damaged documents. They gave excellent results on paper sheets which were locally stuck together. When the paper sheets were stuck on their entire surface however, the results were not as good, as the solvent also seems to have effect on many of the inks. Following these investigations, we were able to establish an emergency protocol applicable to massive amounts of wet glazed papers. In this presentation, we will report on our results and present the protocol that was established from our experience.

Post-flood Development of Mass Treatments at the National Library of Florence: The Roots of Library Conservation

Sheila Waters, Calligrapher and Graphic Design Professional, Private Practice

My late husband, Peter Waters, was Technical Director of the Restoration System for the Biblioteca Nazionale di Firenze (BNCF) in the nine months following the Florence flood of 1966.

This paper explores the conservation methods employed during those early days of the recovery, and the philosophy and reasoning behind the choices made in the treatment of thousands of damaged books from the great Palatina and Magliabecchi collections. The importance of this event was formative to the development of library conservation as a profession; its impact on modern conservation is discussed.

After 50 years I am one of the few participants alive with detailed, personal knowledge of the achievements that occurred during those crucial early months in the BNCF. I worked alongside Peter for three months during 1967 and have access to his diaries, articles subsequently published, and, critically, to his frequent letters home. Those letters will soon be published as a book that will be available at the AIC meeting in Montreal.

The early history of the response is treated chronologically and includes: the call for help Peter received from Howard Nixon, Keeper of Printed Books at the British Museum; Peter's arrival at BNCF the next day (November 25) with Anthony Cains and Dorothy Cumpstey, while student volunteer "Mud Angels" were still digging out books from the basement; the acceptance four days later by the Director, Professor Emanuele Casamassima, of Peter's recommendation to set up a restoration system within the library itself; and the complete implementation of that system within a mere nine months.

Described will be: the changing status of book treatment; expansion of the small technical team and attendant funding problems; the process of experts defining treatment protocols; design and fabrication of requisite equipment; disinfection; removal of mud, oil and contaminants; and pulling text blocks for washing, drying, mending, collating and rebinding. Efficient methods, including heat-set tissue, devised for the mending of tears, filling lacunae and larger areas of loss, went on to influence professional practice. Thirty mending desks and a fully equipped bindery filled the library's main reading room, and adjoining rooms were equipped with temperature-controlled washing sinks and drying cabinets, all of which were custom-designed, fabricated and in operation within nine months of the flood.

In 1969, inspired by his work at the BNCF, Frazer Poole, Director of Preservation at the Library of Congress, invited Peter to design and then head LC's large new Conservation Lab, so our family immigrated from England in 1971. Peter developed his concept of "phased conservation" (eventually renamed "Preventive Conservation"), an approach that would have a lasting impact on all conservation. He retired in 1995, after heading the Conservation Office for 25 years. Under Peter's guidance, honed through the Florence experience, it became one of the major centers for the training of library and works-of-art-on-paper conservators, influencing standards internationally This paper, being an overview of techniques developed during that seminal period, provides a history and information that otherwise might be lost.

Targeted Cleaning of Works on Paper: Rigid Polysaccharide Gels and Conductivity-Adjusted Aqueous Solutions

Amy Hughes, Andrew W. Mellon Fellow, The Metropolitan Museum of Art; Michelle Sullivan, Graduate Fellow, Department of Paper Conservation, J. Paul Getty Museum

The literature of paper conservation bears the evidence of an ongoing movement in the conservator's approach to treatment: a trend aiming toward less manipulation, greater control, and better targeted cleaning. This two-part paper aims to further that progression, presenting the use of rigid polysaccharide gels and conductivity-adjusted aqueous solutions as part of a cleaning system affording conservators greater control and the ability to tailor treatment to specific objects.

The first half of this presentation will provide an overview

of gel systems in local and overall cleaning of works on paper, focusing on agarose and Gellan gum, two naturally occurring polysaccharides. Both form colorless, rigid gels, which may be cut to shape, making them attractive options for a variety of treatment applications, including aqueous and solvent-based poulticing to reduce adhesives, stain and tideline reduction, and overall bathing. Dependent upon the specific polymer, these gels may be prepared with deionized water or aqueous solutions that utilize chelators and other buffers to adjust pH and conductivity.

This paper will present the chemical and physical properties of agarose and Gellan gum, outline the advantages of these gels, and review qualities of paper objects that must be considered prior to gel treatment. Factors impacting gel performance—casting thickness, concentration, additives, and use of a barrier layer among others—will be discussed to demonstrate how gels may be modified to optimize treatment. This portion of the presentation will conclude by briefly summarizing an in-progress, scientific study that utilizes fluorescein dye to assess residue found on papers treated with agarose or Gellan gum. The second half of the presentation will discuss conductivity, or more specifically, ionic strength. Conductivity constitutes a substantial factor in the design of aqueous treatments for those works of art on paper that require improved control of local or overall washing. A conductivity-sensitive approach to treatment enables conservators to create chemically specific aqueous environments, minimizing swelling and disruption of paper fibers during aqueous exposure, while maximizing removal of soluble discoloration products. The effects of solutions adjusted using ammonium acetate salt are distinctly advantageous for moisture-sensitive papers requiring local treatment and can improve the performance of water delivered by swab, poultice, rigid polysaccharide gel, or suction platen.

This presentation aims to clarify both the theory and chemistry of conductivity in the context of paper conservation practice. Since the effects of conductivity are a relatively new line of inquiry in this specialty, this study relies on scholarship produced not only by conservators and conservation scientists specializing in paintings and objects conservation, but also by researchers from the papermaking and agricultural industries. A selection of practical mock-ups demonstrating the efficacy of ammonium acetate solutions will be presented, followed by recommendations for incorporating the solutions into laboratory practice. Considering that ammonium acetate has been untested in the field of paper conservation, this presentation will conclude with the results of pH testing and measurement of volatile organic compounds to assess the potential for salt residues remaining in treated paper.

Soft Matter: Gel development for conservation treatment

Mylène Leroux, Master 2 Student, Paris 1 Panthéon-Sorbonne

This paper will describe and compare different gels used in recent years for conservation treatments. The use of gels may allow for localized treatment, to reduce risk for media layers and to reduce physical stress to paper. To achieve these aim with a gel, a film-forming material which is easy to cut to the correct shape and size is required. This gel must also remain stable to environmental conditions such as pH content and temperature. The material should be very capable of retaining of liquid, such that the liquid is slowly released into the paper; transparent, so we can easily monitor the treatment at any time; non-toxic, so application is safe for the artifact, the conservator and the work environment. It would also be of significant benefit to conservators and institutions if it were affordable and easy to obtain. Polysaccharide gels such as Agar and Gellan Gum are two common products used in a lab. These two physical gels have been proven effective for the cleaning of paper. Studies suggest Gellan Gum has the qualities required and does not leave residues on the paper. "Nanoforart" is responsible for the development of another type of gel. The aim of the "Nanoforart" project was to develop nano-technologies for the conservation of cultural heritage. Different products were developed, such as micro-solutions for consolidation of stone and deacidification of paper and micro-emulsion and micellar solutions for the cleaning of surfaces. The team developed chemical gels as a vehicle for new liquid treatments; acrylamide/bisacrylamide hydrogels and a semi-interpenetrating p(HEMA)/PVP network. Chemical gels differ from the physical gel by the strong bond between the macro-molecules. The gel is less likely to break when handling and is less likely to leave residue. Also, the chemical gel acts like a sponge and can be used with a large range of liquids, allowing for the treatment of very water-sensitive artifacts with a pure organic solvent or one of the liquids developed by the "Nanoforart" team. The studies suggest that those chemical gel have better liquid retention abilities when compared to other physical gels. The introduction of rigid gel in paper conservation interventions allow a greater control on the solvent used and reduce physical risk related to manipulation of the objet. In the literature, few authors were interested in comparing and synthesizing the possibilities, advantages and disadvantages of the aforementioned gels for their use in paper conservation. This paper is my attempt to do so.

A Preliminary Investigation Into the Use of Diethylenetriaminepentaacetic Acid (DTPA), and Ethylenediaminetetraacetic Acid (EDTA) to Treat Iron Induced Foxing in Paper Objects

Brook Prestowitz, Smauel H. Kress Conservation Fellow, Conservation Center for Art and Historic Artifacts; Dr. Charis Theodorakopoulos, Senior Lecturer and Leader of Conservation Science, Northumbria University; Dr. Jane Colbourne, Senior Lecturer and Program Leader, Northumbria University

Iron ions present in paper objects may form colored corrosion byproducts and catalyze oxidation of cellulose resulting in a

decrease in paper strength, staining and darkening of the paper support, and raised acidity levels that amplify acid hydrolysis of cellulose. Degradation due to iron ions in paper can be addressed using chelators that bind to iron ions forming water-soluble complexes that may be washed out, removing iron corrosion and slowing the oxidative degradation of paper objects. A preliminary study was conducted in the laboratories of Northumbria University for the MA Conservation of Fine Arts Program in Newcastle Upon Tyne, UK, to assess the effectiveness of two chelating agents, diethylenetriaminepentaacetic acid (DTPA) and ethylenediaminetetraacetic acid (EDTA), for treating iron induced foxing in paper objects. In order to test chelation in a controlled manner, samples were synthesized by applying iron filings and table salt onto dampened Whatman filter paper in controlled environmental conditions to form iron induced foxing stains. The samples were treated by immersion or local application on the suction table with DTPA, EDTA, sodium dithionite followed by DTPA, and sodium dithionite followed by EDTA. After treatment and monitoring, the samples were rinsed by immersion in deionized water. Visible light reflectance and ultraviolet (UV) fluorescence imaging as well as visible light and fluorescence microscopy were utilized to qualitatively examine changes in the samples. X-ray fluorescence (XRF) spectroscopy was employed to detect iron ion levels in the samples before treatment, after treatment with chelators and sodium dithionite, and after washing in deionized water. Backscatter scanning electron microscopy (SEM) coupled with energy dispersive x-ray spectroscopy (EDX) was used on select samples to examine the physical properties of the paper fibers and iron residues after treatment. Further analysis of the samples before and after treatment including pH levels and alterations of color and brightness were carried out using a digital pH meter with a flat-bottom probe and a portable spectrophotometer. Results showed that aqueous treatments incorporating DTPA and EDTA successfully reduced iron ion levels and visible staining in the paper samples. EDTA was more effective in decreasing iron ion levels and reducing visible staining. Better overall results were obtained in samples treated with sodium dithionite prior to chelation. SEM/EDX and optical microscopy revealed swelling of paper fibers with a few, small deposits of iron residues in samples that were treated by immersion. Samples treated locally on the suction table had areas of disrupted paper fibers with multiple, concentrated deposits of iron residues. UV fluorescence highlighted the formation of fluorescent tidelines in samples treated locally on the suction table and a pale yellow fluorescence in the paper supports of all samples treated with EDTA. Further insight into the effectiveness, aging qualities, and efficacy of treating iron stains in paper objects with chelating agents may be provided with continued research and study of the post-treatment condition of paper substrates exposed to various environments.

TEK-Wiping out the Competition: The ideal reusable absorbent material

Kaslyne O'Connor, Kress Fellow, Art Institute of Chicago

Stemming from the technological and custodial industries, 'TEK-wipe' is a highly absorbent non-woven textile made from a blend of hydro-spun cellulose and polyester. Previously discussed at the AIC Book and Paper Group Tip session in 2014, the popularity of TEK-wipe, and its uses, has since been significantly heightened in conservation.

This progressive material is durable, reusable, extremely strong when wet, chemically stable, and can be easily paired with a large range of conservation treatments. TEK-wipe can be used for washing or drying in place of blotters, as an intermediary layer on the suction table, or for the humidification of sensitive media. Alternatively, it can also be used as a support for lining, drying wet books, cleaning glass plate negatives, for local tideline reduction, and even for varnish removal. As a sustainable alternative to blotters and other absorbent materials, TEK-wipe is available in large rolls or small sheets that can be easily cut and formatted for any treatment size.

This work examines the use and treatment variations that can be paired with TEK-wipe. Case studies of treatment adaptations, as well as methods of re-using this multi-faceted material to preserve its inherent strengths will be presented. With conservation's expanding focus on reusability and durability over the long-term, TEK-wipe is indeed proving to be a material to contend with.

Using New Approaches to an Old Problem: Still Learning from the St. Louis Fire of 1973

Marta O'Neill, Preservation Officer, National Archives and Records Administration, Preservation Program at St. Louis

At midnight on July 12, 1973, fire erupted at the Military Personnel Records Center (MPR) and burned continuously for three days, causing one of the largest disasters in US archives history. By the time the fire was extinguished, 16 to 18 million individual Official Military Personnel files on the facility's sixth floor were destroyed; approximately 6.5 million files survived. Following of the fire, preservation specialists from the Library of Congress and the National Archives in Washington DC went to St. Louis to advise on fire and water-damage recovery. The testing labs at McDonnell Douglas Aircraft Corporation—headquartered in Saint Louis—was also contacted as they were using vacuum drying technology for NASA's space program. The technology had not been widely used to dry wet records, but initial tests on the records showed good results. This was the first time such technology was used on a massive scale. The technology successfully extracted water, but the recovered records still retained fire and water damage, including warping, buckling, fusing and blocking. Ash remained inside folders, unstable inks

either feathered or disappeared; dirt, soot, and building debris clung to the paper; and mold growth abounded. It is also apparent today that browning and brittleness in the paper was sometimes intensified as a result of the vacuum freeze drying.

The National Archives' Preservation Program in St. Louis continues to address these files on a case-by-case basis as records are requested for use. Various traditional treatment options are utilized on a triage basis depending upon reference need, the speed with which a record must be delivered and annual budgets. Developing technologies and treatments are now playing an important role in addressing these records. Digital imaging of fire-ravaged records, particularly those having large ash fragments, using infrared lenses on digital cameras has resulted in significant recovery of lost content. Once scanned, enhancement of the image using software further augments the captured image. Simultaneously, a new treatment option is being tested for those records that are fused, blocked or show high levels of embrittlement. Placing blocked documents in an acetic acid bath results in the successful separation of the block. The initial bath is followed by a rinse bath of de-ionized water, then a bath of calcium hydroxide and finally a bath of magnesium or calcium bicarbonate. The National Archives Preservation Program is increasingly using its social media sites to highlight the testing and use of these new methods as well as the challenges it faces with enormous number of records in it St. Louis holdings. This talk presents a brief history of the fire, immediate and innovative recovery techniques that ensured record survival but caused lasting complications in record recovery, and new options that will help ensure the survival of these national records.

Comprehensive Collection Risk Assessment at the Museum Victoria

Maryanne McCubbin, Head, Strategic Collection Management, Museum Victoria; Robert Waller, President, Protect Heritage Corp.

Occupying multiple buildings, holding large and highly diverse collections, and working within a large matrix management structure are issues that create heightened challenges and opportunities for collection care and preservation. These factors necessitate whole-of-collections and enterprise-wide preventive approaches. Museum Victoria is committed to comprehensive collection risk assessment, as its key framework to drive future investment of resources in collection care and preservation. The cultural property risk analysis model (CPRAM), including its most recent revisions, is being used to structure and document this assessment. Methodological enhancements, such as precautionary defaults for risk variables and delineating respective risk accountabilities for different stakeholders,have clarified communication about risk issues between internal stakeholders.

Stuff Happens, So What? Condition Changes and Loss of Value in Archival Records

Ala Rekrut, Manager, Preservation Services, Archives of Manitoba

Conservators know that cultural property is constantly changing. As part of our preventive conservation work we try to slow down unwanted physical changes by managing the agents of deterioration to reduce the probability and the potential consequences of those changes. Many different kinds of value can be perceived in a single object and stakeholders may also have competing perceptions of value. Our resources are limited, so it makes sense to use them where they can be most effective within our area of responsibility – preserving what's valued by our stakeholders by preventing the physical changes most likely to reduce that value for our stakeholders. This paper discusses the results of a series of exercises to quantify the relative loss of archival value resulting from a variety of physical changes to a range of archival materials. The initial exercise in 2007 was done with archivists responsible for government and private records at the Archives of Manitoba. A historic context scenario was provided and sample items in a variety of analogue media commonly found in archives and exhibiting a variety of types of physical changes were rated on a ten point scale, from no value remaining to no value lost. The types of records considered included manuscript documents, bound volumes, photographs and photo albums, and audio recordings. The types of change considered included mould, stains, cracks, tears, losses, colour shift, deformations, missing elements and musty smells. The agents of deterioration responsible for these changes included physical forces, water, pests, pollutants, light, particulates, dissociation and incorrect relative humidity and temperature. This exercise has been repeated annually with the students in the local Archival Studies program with only minor modifications to the objects and the scenario, and with very similar results. The general areas of agreement and contention regarding the amount of archival value lost in these objects as a result of these changes will be highlighted in the presentation. The presentation will also discuss the implications and practical applications of the results. At the Archives the results were used to create a decision guide to strategically direct resources to the conditions and risks that the archivists had identified as having the greatest potential negative impact on the archival value of records. For the students the exercise builds competency in thinking about materiality in archival record and in understanding changes, as well as introducing them to the agents of deterioration, risk assessment, and the role of preservation/conservation in maintaining, adding and restoring value in archival records.

Preventive Conservation in Changing Times

Carolyn Leckie, Conservator, Canadian Musuem of Nature; Luci Cipera, Conservator, Canadian Museum of Nature

For many museums, budgetary constraints and institutional reorganizations have created a concerning reality. In this climate of change and limited resources, it is easy to lose years of progress in preventive conservation. At the Canadian Museum of Nature (CMN), we have been adapting to this climate and have developed strategies for continuing our highly successful preventive conservation program. While managing increasing workloads, we have been experimenting with ways to leverage our work to keep preventive conservation from becoming an afterthought. By sharing our ideas, we hope to encourage a dialogue about these complex issues. Our immediate concern was to minimize the loss of institutional knowledge about collections preservation. We had already been gathering key foundation documents about our collections storage facility and preservation program. It was critical to continue this work and write a departmental history or framework before items were archived. While responding to and participating in expanding new initiatives, CMN Conservation staff attempted to mitigate preservation concerns by "protecting the core". This meant focusing on immediate projects that would have a long-term effect on collections preservation, including capital renovations and space reallocation of the collection storage building, and highlighting longstanding preservation procedures that were at risk of being lost during a time of significant staff turnover. To ensure the continued strength of our longstanding culture of preservation, a collections-wide Preservation Committee was established to better share and disseminate information. Furthermore, we have contracted out our pest monitoring and have worked closely with the pest control company to ensure a successful IPM program. We have also worked very closely with key internal departments, in particular Facilities and Rentals & Events, to fine tune our approach to preventative conservation. We are also reaching out to museum management and working with

new managers to educate them about our successful preventive conservation program so they can be ambassadors of collections preservation and make more informed decisions as we embark upon new ways of showcasing our collections. We view this as an opportunity to ensure that our highly successful preservation strategies in collections remain a priority in the day-to-day operations of the museum. We are also finding ways to work more efficiently - doing work once and distributing it many times. This involves a combination of reviewing and streamlining old information to ensure it reaches the widest audience possible. We are currently exploring ways of automating this process to facilitate widespread distribution while reducing the workload of Conservation staff. Further, we are trying to find new ways to better integrated into the Museum's planning cycle to address preventive conservation issues as well as highlight outstanding risk assessment priorities.

Spoiler Alert! Planning Around the Pitfalls of Construction Projects

Jeffrey Hirsch, Principal, Director of Cultural Practice, EwingCole; Angela Matchica, Principal, Director of Lighting Design, EwingCole

Oftentimes the design of a new exhibition space is a moment of celebration within a museum. A new home for collection material on display promises enhanced visitor experience, opportunities for educational programs, the potential to reach a larger audience, and maybe (just maybe) a better environment for the cultural heritage itself. But the process of designing and then building brings with it a host of unexpected challenges that have the potential to direct the project away from institutional goals. These risks take several forms that affect collections care in multifaceted ways: Content Museum construction projects must balance the needs of visitors, future flexibility and collection preservation; these goals are often in competition with one another. For example, who determines light levels in the gallery – the architect pursuing LEED points for daylighting, the exhibit designer trying to tell a story, the lighting engineer creating a certain mood in the space, or the collections care staff who are preserving cultural heritage? How does the project accommodate the participation of multiple groups of stakeholders? Schedule Renovating or building a gallery space often accompanies the development of exhibits and conservation work, activities that extend far beyond the design and construction of the built space. How does a museum manage the entire process with overlapping projects and contracts that impact each other? How much time is needed by each party involved and what happens when the schedule begins to drift? What happens when expectations and requirements of the space change during the process? Budget Funding for cultural venues continues to decline, requiring museums to adapt to tighter budgets and nontraditional methods of updating facilities. Once a project is underway, cost management becomes complex. When cost control becomes a crisis, how do shifting funds affect critical project components? How does the museum make the best decisions for the overall project when the solution involves cutting corners that could jeopardize its collecting mission? Opportunity When the dust settles, how does the museum ensure that the project has met its goals of exhibiting and educating the public while preserving its collection?

We suggest that project planning cast a wide net, both to bring an inclusive team to the table from the onset and to anticipate organizational and content-related problems early.

- Identify problems in their entirety
- Assign the right people to their solutions
- Invite their ongoing participation

This presentation draws from our experience as architects and engineers to outline the unexpected pitfalls in capital projects and show how they affect collection care. Understanding the context and complexity of problem solving allows museum professionals to ask better questions of project participants, find allies within their institutions and help manage the project's content towards institutional goals. We will demonstrate how several tools, including simulation software, modeling techniques and mock-up installations, can help bridge gaps in expertise and build consensus that takes into account multiple concerns. We will also discuss strategies for untangling schedules and budgets with an eye towards the unexpected issues that arise during construction.

Art and Noise: Is it a problem?

Margaret Haupt, Head of Conservation, Special Advisor on Collections Care, Art Gallery of Ontario; Andrea Sass-Kortsak, Associate Dean, Academic Affairs, Dalla Lana School of Public Health, University of Toronto

Today's focus on attracting new audiences to museums to engage with exhibitions in a range of ways, has resulted in many museums hosting activities that are unusual in a gallery environment—including concerts, parties, and athletic and dance performances which often involve vigorous physical and extreme audio energy, sometimes close enough to impact works of art. At one such event, the use of "sub woofer" speakers, one floor above, caused visible movement of some sensitive artifacts. A preliminary review has provided several anecdotal reports of damage to fragile objects (mostly fine glass and minerals) after exposure to high levels of noise/vibration. But no information on noise levels or frequencies was documented. The purpose of this project is to review existing information on the effects of high noise/vibration on delicate artifacts and works of art; to quantify sound/vibration levels, including frequency analyses, during events and/or maintenance/construction activities; and to learn when damage may occur. Ultimately, the aim is to identify scenarios/situations where damage may occur and to prevent or mitigate this damage to art and, coincidentally to people (artists, gallery employees and visitors). In this presentation, the collaborators on this project, the Head of Conservation and Collections Care at the Art Gallery of Ontario, and a Professor

of Occupational Hygiene from the University of Toronto will talk about the project and the preliminary findings.

Conservation-Exhibition Design-HVAC: The design and implementation of a plan for the management of RH and temperature control for traveling exhibitions in an historic building

Tadeo Velandia, Conservator, Perpetua restauración

From June to September 2015, the Antiguo Colegio de San Ildefonso (ACSI) in Mexico City presented the traveling exhibition "Earthly and Divine: Islamic Art from the seventh to nineteenth centuries," curated by the Los Angeles County Museum of Art. In order to meet the lending institution's loan requirements for the preservation of the objects, a management plan was designed based on the efficient use of portable dehumidifiers, semi-industrial air-conditioning equipment and wall-mounted, mini-split air-conditioning units. This plan leveraged the thermal characteristics of the historic building while utilizing non-permanent HVAC systems in an otherwise non-climatized space in order to maintain the optimal temperature and relative humidity conditions within +/- 5% RH and +/- 2 degrees Celsius. The successful performance of this system makes it a viable model for traveling exhibitions in spaces without permanent climate control.

This work was made possible through an interdisciplinary effort coordinated by the conservator and the Head of Exhibitions & Registration, and involved staff from LACMA, and the ACSI offices of Exhibition Design, Maintenance, Exhibition, and Administration, as well as HVAC technicians. The fundamental elements for the implementation of this plan include the management of visitors/group flow through the galleries, the construction of ventilation chambers (plenum space), a monthly program of equipment maintenance and daily monitoring. So, a strict management of the human resources of the museum can replace, at least for a limited period, an automated central air system. This model also works as a zone control or a humidity back up system that functions in the room as a low-cost improvement to a central HVAC system. This project also allows for reflection about the traditional and new roles of the museum conservator; our new roles go beyond the limits of a conservation that tends to be merely prescriptive, opening channels from which one can implement solutions based on interdisciplinarity. It also raises viable alternatives for inter-institutional negotiation on the basis of a realistic definition and practical approach to conservation problems.

There is a clear difference between conservation and those departments committed to exhibition planning and design, and each serve very specific problems within the museum. At the institutional level, the distinction is marked in such a way that it promotes a separation between the conservator and the other departments. Nevertheless, from experience, for a conservator that uses more of an operational logic, more participative, the distinction does not exist, or at least the division is not so clear. In our case, the traveling exhibitions have forced us to adapt the classic scheme of conservation, and working as a team. We have managed to adjust the "rule" without trangressing it, understanding it well before application, streamlining the process, and given the necessary elements to work with, making simple and efficient solutions; unfortunately these situations and their results often stay within the private world of the individual museum. To grow as a field, we must open those doors and discuss this common experience.

Saving Collections in an Uncertain World: Context, collaboration and training

Fiona Macalister, Independent Preventive Conservator, Independent consulant and practitioner; Claire Fry, Preventive Conservation Consultant, Spencer & Fry; Christine Murray, Preventive Conservation Adviser – Skills & Projects, National Trust; Bethan Stanley, Senior Collections Conservator, English Heritage Trust

With the effects of climate change, civil unrest, war and tighter financial constraints collections are increasingly at risk. Threats include: wide spread flooding, fire, landslides, storm damage, terrorist activities and poor maintenance. Recent events in the UK have included the fires at Clandon Park, National Trust, and the Glasgow School of Art. Planning and training in collaboration with others are key to success, building resilience. Involving staff and external agencies: building managers, emergency services, fire safety advisers, insurers, curators, gardeners, volunteers, registrars, communication officers, safety officers, emergency planning officers, external colleagues. Effective training in emergency planning and the salvage of collections is vital to enable responders to take the necessary actions to reduce the impact on collections, limit damage, and minimise costs incurred. "The best investment in training I've ever made." So spoke the Operations Manager of a National Trust property having sent a member of staff on the three day English Heritage/Historic England/National Trust Emergency Salvage course, run quarterly in conjunction with the West Midlands Fire Academy at the fire training ground, under the chairmanship of Historic England, through the former Department Culture Media and Sport (DCMS) Emergency Planning Group, Training Sub-Group. A few weeks after the staff member received training the property experienced water ingress. Methods learnt were quickly implemented, reducing the scale of the damage and costs. By December 2015 c. 700 people from museums, historic houses and heritage organisations across the UK will have attended this course. The course is practical, a good model, develops familiarity with the working practices of the fire service and fosters local networks, key to effective response. This paper will address the following:

- the context

- training - course development and methods and the history of training at the National Trust for England, Wales and Northern Ireland and English Heritage
- collaborative and multidisciplinary working

In the UK the context includes legislation such as the Civil Contingency Act 2004 and relevant standards. Use can be made of UK Resilience Local Community Risk Registers and information available through the Environment Agency. There is a requirement, under the Fire and Rescue Services Act 2004, for the Fire and Rescue Authorities to safeguard historic environments and to address this within their published strategies.

Making It Up As We Go Along: How We Got It Right By Doing Everything Wrong

Rebecca Elder, Principal; Rebecca Elder Cultural Heritage Preservation; Amy Bowman, Photographs Archivist, Dolph Briscoe Center for American History

In May 2015, as severe flash flooding was predicted for Central Texas, conservators recognized the risk for significant damage to personal collections and began to mobilize, quickly beginning an advice line and contacting the media and Red Cross with tips for salvage. They also ran salvage training classes for local library school students. In a separate initiative, after a 500-year flood swept away the contents of hundreds of homes along the Blanco River, area archivists offered assistance to a local public library serving as an impromptu depository for found photographs. As the recovery began, the two projects converged.

While the Incident Command System works well for institutional disasters, we found that for these smaller, personal disasters, an improvisational system with a fluid organizational structure enabled us to tap each individual's professional talent and expertise more effectively and provide a quick response that minimized damage to materials. Our disaster response efforts were not without obstacles--we grappled with the ethical issue of giving salvage advice to non-professionals who would likely never be able to afford a professional conservator to treat their personal collections and performed delicate diplomacy to manage the expectations of a community under great stress. In the end, we were able to perform a great service for our community and introduce our profession to the broader public who had likely never heard of it. At the same time, the experience forged a professional alliance that strengthened the bonds between archivists and conservators in the Central Texas area, helped archivists and students in our School of Information learn procedures for dealing with a disaster in their own institution, and provided invaluable lessons in the effective use of both traditional and social media outlets. While none of us looks forward to the next disaster, we are all optimistic that we can do an even better job next time.

Building an Emergency Response Plan for Archaeological Sites

Caroline Roberts, Conservator, Kelsey Museum of Archaeology, University of Michigan; Alice Boccia Paterakis, Director of Conservation; Kaman-Kalehöyük, Yassihöyük, and Büklükale Excavations, Japanese Institute of Anatolian Archaeology; Sofia Lo Bianco, Frames Conservator, Art Gallery of New South Wales; Vale Vafaei, MSc. Student, University of Bologna Science for the Conservation-Restoration of Cultural Heritage Program

This paper discusses the unique challenges of emergency response planning for archaeological sites. Field conservation diverges from museum conservation for many reasons. These include the seasonal nature of excavations, limited access to materials and equipment, and the fact that excavated structures and on-site records may be a higher priority for preservation than excavated artifacts. A response plan designed for an archaeological site must therefore take a different shape, structuring itself around the site's specific preservation goals and taking into account the perspectives of all stakeholders. It must address risks that are unique to the site and region and make use of resources that are readily available. Most importantly, it must be inclusive of the people living in the local area, because they may be the only first responders available at many sites.

To illustrate these unique challenges, I will present a case study that details my experience building a response plan for the Japanese Institute of Anatolian Archaeology (JIAA) at Kaman-Kalehöyük, Turkey. Located approximately ninety miles southeast of Ankara, the JIAA encompasses a wide range of cultural resources, including three archaeological sites, a library and archive, five storage depots, a museum, and fifty thousand inventoried artifacts. The case study will outline the process of developing a plan that balances the documentary and preservation priorities of the JIAA, presents guidelines for the salvage of materials preserved at the site, and aims to be accessible to both archaeologists as well as local stakeholders. The plan itself is unique to Kaman and its particular risks, resources, and culture. The process of creating such a plan, however, can be adapted to any archaeological site.

Specific recommendations include: risk assessment prior to response plan development; formation of a response planning team representing research-, community-, and government stakeholders; creating a priority list of cultural heritage to be preserved; ongoing training, with practice sessions such as tabletop exercises and phone tree tests; and finally, review of plan accessibility – language, value barriers – and outreach effort. At the JIAA, a recent review of the plan has prompted the production of a pocket guide that will provide up-to-date emergency information for first responders. Within the broader framework of site preservation and management, a site-based emergency response plan serves as an essential point of clarity, mitigating loss by defining priorities, outlining specific plans of action, and ensuring effective response through community engagement and direct communication of values.

When Emergency Preparedness (or even an Emergency) is Foreign Territory

Joelle Wickens, Associate Conservator, Head of the Preventive Conservation Team and Affiliated Assistant Professor in Art Conservation, Winterthur and University of Delaware; Anisha Gupta, Third-year graduate fellow, Winterthur/University of Delaware Program in Art Conservation; Jacinta Johnson, Third-year graduate fellow, Winterthur/University of Delaware Program in Art Conservation; Kari Rayner, Paintings Conservator, Hamilton-Kerr Institute, Cambridge University; Jessica Walthew, Research Fellow, The Metropolitan Museum of Art

The development and implementation of a collection emergency preparedness plan can appear to be a monumental task. Low institution-wide collection emergency awareness paired with minimal staff time and limited resources are common factors. Though literature on developing plans continues to grow, knowing how to start can still be challenging. A team of students and faculty from the Conservation Center (Institute of Fine Arts at New York University) and the Winterthur/University of Delaware Program in Art Conservation pursued this challenge at an institution where no collections-oriented emergency plan existed: Schloss Leopoldskron, an 18th-century palace in Salzburg, Austria. Through collaboration with the Schloss' staff and local authorities, the team identified the elements of an emergency plan that should be completed while the team was on-site. As outside consultants, the challenge was not only choosing how to begin, but also how to teach the staff the notion of collections emergencies and introduce them to potential preventive measures. Based on a risk assessment completed by the team, a collection emergency scale system was developed to educate the staff and define various levels of collection emergencies, particularly focusing on small-scale, day-to-day situations. The Schloss staff had previously established emergency reporting systems for medical emergencies and fires. The team worked with the staff to build on this by assembling an emergency response team, defining roles specifically for collections emergency situations. Additional resources were gathered for the staff to continue expanding their preparedness materials, including a simple pocket guide that can be used during an emergency. Communication between the staff, the emergency response team, and local authorities was an essential component of developing a sustainable emergency plan. This collaboration highlighted significant cultural differences in the approach to emergency planning between institutions in Austria and the U.S. and thus allowed the exploration of foreign territory on many levels. The team developed new skills in the areas of learning and teaching, understanding the big picture while balancing the day-to-day activities, working with limited resources, and accepting the need for flexibility. In the end, two weeks on-site provided constructive recommendations for emergencies, a safer environment for the collection and the Schloss, and a learning experience that, when shared through this presentation, will provide valuable knowledge for others. This project was supported by the Samuel H. Kress Foundation and Salzburg Global Seminar.

Conservation and Digital Preservation: (Where) Do the Two Roads Meet?

David Stevenson, Conservator, Canadian Centre for Architecture

To state an obvious fact, Conservators are concerned with tangible things. Objects that we can see, assess, and address is central to all conservation pursuits. Without the ability to observe and assess, as Conservators we cannot move forward in our efforts. To state another obvious fact, you can't actually see binary code, the basis of all digital information. Collecting institutions are in the earliest days of acquiring what will become a more prominent aspect of their collections: digital material. In years past, the word 'digital' in the context of archives, libraries and museums has evoked ideas of digital portable physical media, including hard drives and optical media. The real digital object is not the physical information carrier, but rather, the digital file, with all of the intellectual, creative and informational content that it holds. However, unlike the physical paper object, photograph, artifact, book or painting, the properties of these files may not be immediately evident, or even accessible.

The majority of digital preservation is non-tangible: the software or the operating system to support access to files, the bit stream of the file, or the metadata that is buried in an associated file. And yet, preservation efforts are essential, as digital objects are constantly at risk and require attention and monitoring over time. Also too, processes of preservation are unfamiliar: metadata extraction, file normalization, and auditing. For preservationists, this deviation from our standard methodologies of observation and assessment raises so many concerns and questions. Can the mindset and training of the Conservator, given our natural preoccupation with the physical object, aid in understanding the esoteric digital object? Do digital objects have "artifactual" properties? If preservation efforts necessitate change to the digital object, what principles will guide us? Are there transferrable concepts, or practices, between these two different but necessarily linked fields of practice?

This presentation would aim to address the questions above, by using the Canadian Centre for Architecture as an example; while at the same time looking at the bigger picture from different perspectives.

Videotape Deterioration Mechanisms and Conservation Remedies: A Primer

Erik Piil, Associate Conservator, The Kramlich Collection / New Art Trust

Art as thin as a human hair running a mile a minute presents big challenges for the conservation community. Conservator Erik Piil will cover the landscape of common videotape deterioration mechanisms including binder instability through hydrolysis, repeated playback degradation, debris contamination, and other alteration processes. Erik will also detail various communities' efforts to establish a metric for videotape deterioration, highlighting ongoing projects as an example of how the current body of scholarship intersects with emerging practices.

How Sustainable is File-based Video Art? Exploring the Foundations for Best Practice Development

Brian Castriota, Marie Skłodowska-Curie ITN Research Fellow, University of Glasgow; Sophie Bunz, MA Student at Berne University of the Arts, Berne University of the Arts; Flaminia Fortunato, MA Student at Berne University of the Arts, Berne University of the Arts; Carole Maître, MA Student at Berne University of the Arts, Berne University of the Arts

The acquisition of file-based video artworks into museum collections charged with ensuring their long-term viability and accessibility presents conservators and collection caretakers with many challenges. Masters and exhibition copies are delivered to museums as video files in a variety of wrappers, codecs, and compression factors, selected by the artists for deliberate or incidental reasons. Video file sustainability has been a focus of many discussions within the archival and preservation communities over the last several years, and some museums are now stipulating specific file deliverables and/or are normalizing artist-provided files to uncompressed formats for long-term preservation and access. Key concerns about the longevity of file-based video are (1) insufficient self-documentation due to inconsistent or incomplete metadata, (2) unannounced redesigns and updates of proprietary codecs by the industry, (3) incompatibilities with codec successors, (4) inconsistent file playback on software players due to industry changes to codec libraries or interpretation parameters of video image and sound, (5) legal restrictions on the exchange and dissemination of proprietary codec libraries, and (6) the lack of implemented practices for monitoring and quality control for file-based video, on the artist's side and the museum's side.

This paper aims to explore these and further issues observed in daily practice at the Media Conservation Lab of the Solomon R. Guggenheim Museum, and is the product of a research consortium that was formed as part of an ongoing collaboration between the Guggenheim Conservation Department and the Master's degree program in Conservation at the Berne University of the Arts (Switzerland). The authors of the paper employed a research methodology that included literature review, practical tests, and interviews with internationally recognized experts engaged with codec development, software engineering, copyright law, archiving and conservation of digital video. The present study highlights specific areas of consensus around the risks and factors affecting sustainability, discusses different preservation strategies, and aims to contribute to the development of a basis for establishing best practices for the future acquisition of file-based video art.

Recovering the Eyebeam Collection Following Superstorm Sandy: Conservation lessons for all revealed by a multimedia disaster

Kara Van Malssen, Senior Consultant, AVPreserve

In the Fall of 2012, Superstorm Sandy struck the New York City region, destroying or badly damaging homes, businesses, and infrastructure. As is the case with all disasters, numerous cultural heritage materials, both personal and institutional, were amongst the damage. Once the storm passed, several museums, libraries, archives, galleries and other collecting institutions across the region, in particular those close to the city's numerous waterways, faced the recovery of both their inundated buildings, as well as the artifacts contained within. Amongst those affected was Eyebeam, a non-profit art and technology center dedicated to exposing broad and diverse audiences to new technologies and media arts. Founded in 1997, Eyebeam supports residencies and fellowships by artists and creative technologists, stages exhibitions, and runs educational programs.

Since its inception, Eyebeam has collected the creative output of its residents and fellows — including video, audio, and software-based artworks and their related documentation — as well as recordings of the organization's numerous events. The result is a growing collection of over 3,000 analog and digital media items, many of these original art works, on formats ranging from data tapes and discs dating back to the late 1990s, to myriad video and audio formats. During the storm, Eyebeam's building, located in Manhattan's West Chelsea, filled with 3-4 feet of highly corrosive saltwater, submerging approximately 50% of this collection.

This presentation will tell the story of the expert-lead, volunteer-driven effort to urgently stabilize the Eyebeam media collection in the days that followed the storm. The discussion will focus on methods used for establishing a network of responders while day-to-day communication lines were down, working with trained and untrained volunteers, triage efforts, conservation techniques used for the variety of formats, roles and teams, mechanisms used to mitigate risk of loss and further damage, and outcomes. The presentation will stress the critical disaster preparedness and preventative conservation lessons that emerged through this experience, including the requirements of intellectual control for collections in today's data-driven conservation ecosystem, and the need for valuation and prioritization within large collections. Chief amongst these lessons is the role that digitization and proper digital preservation can play in protecting heritage from disasters and conflict, not only for media collections, but for collections of any kind.

Re-Constructions: Preserving the Video Installations of Buky Schwartz

Eddy Colloton, MA Student, Moving Image Archiving and Preservation, NYU

Buky Schwartz (1932-2009) was an Israeli-American conceptual artist whose work focused on the nature of perspective and perception. Schwartz worked in many different art forms, but he is best known for his single-channel video works, and video installations. Trained as a sculptor in Tel Aviv, Schwartz studied at St. Martin's School of Art during the 1960s, and moved to New York in the late 1970s where he began experimenting with video in his SoHo studio. His work was quickly noticed by John Hanhardt, a curator at the Whitney Museum of American Art, who included Schwartz's Yellow Triangle (1979) in the Whitney's Re-Visions exhibition in 1979. Schwartz's video installations often involve a distorted, unrecognizable pattern in real space, which, from the privileged perspective of a video camera, forms a coherent image fed to a monitor in the gallery in real-time. Concerned with the psychological process of perceiving three dimensional space, the artist's video installations are often large, made up of a variety of materials, and must be installed to be appropriately experienced. As the nature of such a work is accumulated through multiple components, iterations and concepts, rather than any one particular object or thesis statement, the dizzying array of variables and treatments can easily become overwhelming. What are the limits of Schwartz's installations? How rigid an interpretation is restrictive? How flexible can a work be before it loses its identity? By accumulating relevant and significant forms of documentation, while examining the artist's oeuvre and creative process, I hope to answer some of these questions. Correspondence between the artist and curators, photo documentation of installations, sketches and models created as studies, interviews with the artist and interviews with his collaborators were all reviewed and compiled to develop a comprehensive understanding of Schwartz's installations. Using this information, garnered from the artist's personal archive, the records from multiple museums, and published sources, I will outline prescriptive preservation policies for video installations which have not been exhibited in decades.

Matters in Media Art III: Sustaining Digital Video Art

Martina Haidvogl, Associate Media Conservator, San Francisco Museum of Modern Art; Peter Oleksik, Assistant Media Conservator, San Francisco Museum of Modern Art

Launched in 2005, this collaborative project between the New Art Trust (NAT) and its partner museums – the Museum of Modern Art (MoMA), the San Francisco Museum of Modern Art (SFMOMA) and Tate – has been designed to help those who collect and keep time-based media artworks. Conceived

originally as a consensus building project for the three partner museums of the NAT, the enduring goal has been to affirm our commitment to time-based media art and artists by developing shared practices for the works' care and preservation. It has always been the consortium's hope that if the three museums could come together to agree on emerging stewardship practices, then by sharing these practices online they would be used, improved upon and refined by larger audiences of artists and collectors. The first two phases of Matters in Media Art on acquisitions and loans, published online in 2005 and 2008 respectively, established the project's track record as a model for inter-museum exchange. Today we are thrilled to present the third phase in this exciting collaborative project: Sustaining Digital Video Art. This phase ventures to provide recommendations and assistance to collections of all sizes—from museums to artists, galleries, and small private collectors. By providing a comprehensive approach to assessing, managing, and storing digital video art, we hope to support and encourage practices and workflows in an area that is challenging to individuals and large institutions alike. Two representatives of the Matters in Media Art project, Martina Haidvogl (SFMOMA) and Peter Oleksik (MoMA), will present the background of phase III and provide a walk-through of the much anticipated, newly launched website.

Putting the Time Base back in Time Based Media Conservation

Benjamin Turkus, Preservation Project Manager, Bay Area Video Coalition; Kelly Haydon, Preservationist, Bay Area Video Coalition

Leitch. Digital Processing Systems. Fortel. Snell & Wilcox. For the video formats that require the stabilizing force of a time-base corrector (TBC) to be digitized, the selection of TBC is second to only that of the videotape recorder. But despite the critical role played by these remarkable, increasingly obsolete machines (the earliest of analog-to-digital devices), their inner-workings remain a mystery to many of those responsible for reformatting analog video materials. Color, definition, stability, interlacement errors, preponderance of drop out—these things all rely, and, to a certain extent, vary, depending on the choice of TBC. During this presentation, members of the Bay Area Video Coalition's (BAVC) Preservation team will stake a renewed claim for the significance of TBCs in media conservation, under-discussed, yet essential components of video and digitization systems.

Beginning with an overview of helical scan recording technologies, Haydon and Turkus will deconstruct the time base, which, like all forms of video technology, is rooted in the rapid-fire transformation of light into electronic signal. Pinpointing the various distortions (tape damage, stretching, mechanical speed variation, oxide loss) that can affect the sync pulses that play a critical role in the playback of recorded signal, Haydon and Turkus will walk the audience through why time base errors occur, and how they are "corrected" by these devices. Presenting a series of case studies from the recent BAVC preservation projects, with a particular focus on formats from the heyday of video art (CV, EIAJ-1, ¾" U-Matic), the speakers will use side-by-side visual comparisons and analytical data provided by QCTools to demonstrate the at-times subtle, at-times significant differences between time base correctors. With relevance for both in-house and outsourced video digitization projects, Haydon and Turkus will guide collections holders in taking a more active role in the selection of TBC, communicating with vendors both at the outset of a project (the RFP/SOW process) and during playback testing. Haydon and Turkus will conclude with a critical look at the omission of "peripheral" machines such as TBCs from discussions of the magnetic media crisis. The obsolescence factors that affect TBCs, and the difficulties (and expense) of repairing and procuring functioning TBCs on the open market will only increase in magnitude in the coming years. Just as time-based media conservators should know the names of TBC manufacturers, they should also begin actively preparing for this inevitable decline.

Slow Dissolve: Re-presenting synchronised slide-based artworks in the 21st Century

Fergus O'Connor, Senior Conservation Technician (Time-based Media), Tate

Tate has a collection of twenty-eight slide-based artworks, and eleven of these have the added complexity of needing synchronised projectors. 35mm slide-based artworks initially appeared in the mid-to-late 20th century, at a time when magnetic audio tape and slide projectors were commonplace. Many artists adopted synchronisation technology originally used commercially in the audio-visual industry for slide-tape (or multi-image) presentations, as it enabled a means of recording and replaying slide shows using multiple projectors with the addition of a soundtrack.

There were 5 main systems which were widely used by artists but are now obsolete technologies: Kodak, Electrosonic, Dataton, Stumpfl and AVL (Audio-visual Laboratories). Industry support and expertise in 35mm slide production is vanishing and the associated presentation equipment has become increasingly difficult to locate and maintain. Whilst being predictable the death of this medium provides many technical challenges as we attempt to better understand the coded synchronisation signals which enable the cross fades, slide transitions and timings for each artwork. Tate's objective is to display these works in their original formats for as long as possible, but because of the obsolescence of both the synchronising and slide technologies, we must also investigate how to reproduce and present these works using modern technology.

This paper will discuss the results of this investigation using an example from the collection, starting by comparing two of the most common control systems, AVL (Audio-visual Laboratories) and Dataton, how they work, their capabilities, the key differences and issues of compatibility. This paper will then explain the strategies that we are adopting in terms of creating

and managing our slide equipment pool. One of the key aspects is trying to, where possible, adapt all artworks to run with the currently better supported Dataton system. This may impact the appearance and feel of the projection, and this will be taken in consideration when making the decision to adapt it. Because of the obsolescence of the analogue slide material, it is necessary to consider the option of showing these works digitally, this paper will conclude by explaining the options for the digital versions of these works.

When Functionality is Everything: A case study in recovering flood damaged electronic parts from a musical instrument collection

Hayley Robb, Objects Conservator, National Music Centre

This paper aims to describe the process of treating and rehousing flood damaged electronic parts from a living (a.k.a. usable) musical instrument collection.

The National Music Centre (NMC) was one of the heritage institutions affected by the floods that swept across southern Alberta in 2013. Approximately 7000 sq ft. of storage was submerged in water for days, adding up to a total loss of 2.5 million dollars to NMC's collection of historical musical instruments. One area that sustained the most amount of damage overall was the collection of vintage electronic parts and materials, which was submerged under almost 60" of dirty, silt-laden water.

This particular collection of electronic hardware – comprising of miscellaneous circuit boards, microchips and vacuum tubes, among other things – do not technically qualify as artifacts. They weren't collected for display or research purposes, but rather for use in future repairs to the electronic instrument collection. Approximately 10% of the instrument collection at NMC is maintained in working condition, which has enabled the organization to design many unique programs that grant visitors unprecedented access to historic instrument sounds. The continued care and accumulation of spare parts for use in repairs and restorations is invaluable to the organization's sustainability plan for the living instrument collection, and to the National Music Centre's ongoing mission.

As such, the needs of this collection are unique and unprecedented, and have informed much of the treatment process. The goals of this conservation project were not only to recover the electronic parts from the damaging effects of a flood, but also to ensure the parts were stored in such a way that preserved the working life of each electronic part for as long as possible.

Highlights of this paper will include: cleaning techniques and equipment used, including the use of ultrasonic cleaning tanks to clean over 1000+ circuit boards; storage protocols developed during the project; types of electronic-specific storage materials used, such as conductive foam for integrated circuits; and important collection management details about the type of information captured in our new electronic parts database. This paper will also touch on the types of unconventional information sources found throughout the research process, as well as lessons learned from NMC's collection staff during the flood recovery efforts.

Pinball for Posterity: Adapting the preservation principles of libraries to preserve arcade and pinball collections at The International Center for the History of Electronic Games

Carrie McNeal, Director of Conservation, The Strong; Jeremy Saucier, Assistant Director, International Center for the History of Electronic Games, The Strong; Martin Reinhardt, Arcade Game Conservation Technician, The Strong

As industrial and technological advances continue to change the material landscape of our world, some of our most unexpected challenges arise when cultural institutions accept the responsibility of preserving artifacts that are new to the museum scene. The International Center for the History of Electronic Games (ICHEG) at The Strong holds the largest and most comprehensive public collection of video, arcade, and pinball games, other electronic games, and electronic game-related historical materials in the United States. The mission of ICHEG is multi-faceted. It involves not only collecting and preserving these materials, but also making them available to researchers and museum guests for play, research, and historical interpretation. This creates the unexpected challenge of balancing accessibility of a collection with preserving mechanical, electrical, material, and design components.

As the arcade and pinball game collection continued to grow rapidly and bring with it an onslaught of new preservation challenges, ICHEG looked to the established conservation principles of libraries as a framework for developing a policy for this collection. Just as libraries must balance their concurrent missions of preservation and access, ICHEG has adopted a mission to both preserve and provide access to the experience of playing arcade and pinball games. After an extensive review process and collaboration between the directors of ICHEG, curators, and conservators, the collection was divided into General and Special Collections categories. The Special Collections category was then further divided into three additional categories, each with increasing levels of restriction. These are the Monitored, Controlled, and Restricted Collections, respectively. Each level carries with it increasing stipulations that govern guest and researcher interaction, exhibition, and conservation procedures.

This presentation will explain the rationale behind adapting a library preservation structure for use with arcade and pinball games, and will present the criteria used by ICHEG to develop the categories and divide the collection. It will also detail the use, research, exhibition, and conservation guidelines and restrictions associated with each category. This preservation policy

provides a framework for adapting guidelines and procedures that are already familiar within the conservation community to inform preservation decisions for new and different types of collections.

Emulation as a Conservation Strategy for Software-Based Art

Panelists: Deena Engel, Clinical Professor, New York University; Dragan Espenschied, Digital Conservator, Rhizome; Ben Fino-Radin, Associate Media Conservator, The Museum of Modern Art; Mark Hellar, Hellar Studios LLC; Joanna Phillips, Conservator of Time-Based Media, Guggenheim

We propose a 75-90 minute panel with case study presentations to discuss emulation as a conservation strategy. We will begin by defining emulation and describing how it works; the resources required to implement emulation; and criteria to determine whether emulation is an appropriate strategy for a given work of software-based art. We will also clarify the similarities and differences between virtualization and emulation in our introduction and in our case studies. The present landscape of emulation technologies and strategies, their costs, barriers to entry, and relative merits will be discussed. We would then present four case studies from three museums. In some cases, emulation has worked well for study and/or re-exhibition purposes; and in other cases, emulation has not worked well. Our team will discuss each case study: what we learned; why emulation did or did not work out; as well as short- and long-term plans to study and/or re-exhibit these works based on our experience with emulation.

We plan to provide a collaboratively edited bibliography (both as a printed handout and a web page) of websites and other references and resources that we have found helpful in our work. Our panel will conclude with time for an open Q&A session.

Proposed case studies:

- In-situ emulation of Net Art: Solomon R. Guggenheim Museum: Unfolding Object (2002) by John Simon and Netflag (2002) by Mark Napier
- Emulation for curatorial research and access: The Museum of Modern Art (MoMA) and San Francisco Museum of Modern Art's (SFMOMA) co-acquisition of graphic designer Susan Kare's archive.
- Emulation in exhibitions: examples from two years of exhibiting video games at Museum of Modern Art (MoMA).
- Emulation as a Service: providing online public access to emulations of Theresa Duncan's CD-ROMs at Rhizome.

Best Practices for Conservation of Media Art from an Artist's Perspective

Rafael Lozano-Hemmer, Artist, Rafael Lozano-Hemmer Studio

For most artists I know "Art conservation" is a troubling affair: we are already too busy maintaining operations as it is, we think of our work as a "living" entity not as a fossil, we are often unsure if a project is finished, we snub techniques that may help us document, organize or account for our work as something that stifles our experimentation and creative process. In addition, especially when we are resentful that institutions are not collecting and preserving our work in the first place, we reject the whole concept of an Art collection, —agreeing with critical historians for whom collecting and preserving contemporary Art represents an obsessive-compulsive vampiric culture of suspended animation and speculation that is grounded in a neo-colonial, ostentatious, identitarian drive: Nietzsche's "will to power" mixed with Macpherson's "possessive individualism."

For this text let's assume you are already at peace with the contradiction that is conservation: you are now interested in both creating the work and overseeing its death or zombification. Perhaps despite being a staunch democratic socialist you now have your own Art collection. Or maybe you have met a few collectors who take risks with you, acquire your work and help keep your studio afloat financially. Most importantly, especially if you are an insecure megalomaniac like me, you don't want to disappear from history like so many great artists who are not collected by important Museums. So here we are, thinking about the topic of conservation in media art. As you know, there is a plethora of existing initiatives to preserve media artworks, but these are always from the perspective of the institutions that collect them. While most institutional programs include excellent artist-oriented components like interviews and questionnaires, the programs are all a posteriori, almost forensic, as they look at the work in retrospect, as a snapshot of time.

This text is written to outline what artists may choose to do on the subject in order to i) simplify our life in the long run, ii) generate income, and iiii) take ownership of the way our work will be presented in the future. I welcome variations, additions and comments. Yes, it is absolutely unfair for the artist to have to worry about conservation of their work. Now let's get on with it. Introductory excerpt from Best practices for conservation of media art from an artist's perspective at: https://github.com/antimodular/Best-practices-for-conservation-of-media-art.

Susan Kare and Her Macintosh Icons: A Co-Acquisition

Ben Fino-Radin, Associate Media Conservator, Museum of Modern Art; Martina Haidvogl, Associate Media Conservator, San Francisco Museum of Modern Art; Mark Hellar, owner, Hellar Studios LLC

In the spring of 2015, the San Francisco Museum of Modern Art (SFMOMA) and the Museum of Modern Art (MoMA) investigated co-acquiring a selection of icons of a graphic designer who pioneered countless design concepts in user interface and human-computer interaction and gave Macintosh computers a sense of personality through her iconic designs: Susan Kare. Kare's archive as it presented itself to the two institutions included hand-drawn graphics, a sketchbook, and over 300 floppy disks containing born-digital artifacts. Spanning over almost two decades, this collection beautifully documents Kare's working process and allows us to tell the story of the creation of today's most famous Macintosh icons. This paper will detail the thrilling, and at times challenging, path of accessing the icons on floppy disks, examining them, emulating them, and facilitating broad cross-disciplinary review by curators and conservators at MoMA and SFMOMA.

This acquisition has caused all involved constituents to face numerous challenging questions, some for the first time. How do museums approach born-digital archives comprised of hundreds of files in varying states of obsolescence and obscurity? How can two institutions effectively engage in a co-acquisition when there are great information management needs in order to support effective curation? How can conservators provide curators with a stable and consistent viewing environment for born-digital materials that are multi-faceted and could be viewed myriad ways depending on the software used to interpret the material? How can tools designed for forensic analysis be adopted for the mass analysis and curation of a panoply of files and materials? This paper aims to answer some of these questions, by detailing how SFMOMA and MoMA collaboratively ventured to acquire a selection of a large convolute of digital icons, living on obsolete data media – and will look to the future of how these artifacts of user interface design will be exhibited both within the walls of institutions, and more broadly on the web.

Unauthorized Archives and Unreleased Software: Preserving a Cancelled Project

James Hodges, PhD Student, Rutgers University

Unexpected cancellation can strike any time in the software business, forcing developers to re-evaluate their recent projects. This paper examines one such cancelled project, the Sega home video game Sonic X-Treme, in development between 1994 and 1997. After the project's cancellation, collectors and bootleggers began to trade development materials with members of the Sonic X-Treme production team. Today, former lead designer Christian Senn has emerged at the center of a grey-market peer-to-peer preservation effort. This paper suggests that such unauthorized preservation efforts can help to produce robust historical records of their era, allowing multiple narratives and collections to be constructed in the process. Using a sociology of knowledge approach to this phenomenon, the paper treats Senn, his collaborators, and the materials themselves as active participants in the ongoing construction of a Sonic X-Treme archive. The Sonic X-Treme project provides a pertinent case study in recovery from data loss, emphasizing that many preservation emergencies are caused by social, legal, and business factors, rather than by physical degradation.

Tracing the history of materials collected in Senn's current "X-Treme Archive," the paper addresses three specific iterations of the material, in terms of their audio/visual formatting and social/historical context. In each case, the materials' formal characteristics are emphasized over their specific contents. While the collections' contents possess obvious value as primary sources in the business history of the video game industry, focusing on their formal and material traits helps to reveal the role that individual actors play determining the legacy of both a project and its developers. Examining the format of image, video, and software contents in multiple Sonic X-Treme collections, file formats become key players in the ongoing production of historical narrative surrounding the unfinished game. In conclusion, the paper notes significant ways in which Sonic X-Treme, far from unique, provides an illustration of processes that can also be found at work in nearly all technological development. For Latour and Woolgar (1979), technical artifacts and the knowledge thereof are constructed over the course of various social operations. Human actors attribute meaning to physical objects in a process of inscription, while the successful stabilization of an object's form can only take place in a social context that makes it legible. In terms of Sonic X-Treme, each collection of game-related material is the result of an attempt to stabilize social situations in a way that give the game its desired significance.

Implementing Risk Management Strategies for the Manguinhos Historic Site: Protecting built heritage and collections

Carla Maria Teixeira Coelho, Architect/Researcher, Casa de Oswaldo Cruz/Fundação Oswaldo Cruz; Marcos José de Araujo Pinheiro, Vice-director of Information and Cultural Heritage, Casa de Oswaldo Cruz/ Fundação Oswaldo Cruz

Manguinhos historic site, located at the north zone of the city of Rio de Janeiro, houses a significant part of the scientific and cultural heritage of Fundação Oswaldo Cruz (Fiocruz), linked to the Ministry of Health of Brazil. It includes almost 40 collections (documental, bibliographical, museological and biological), historic buildings and archeological sites. Much of this heritage was generated over more than a century by the work processes of the institution, created in 1900 to produce medicines and conduct research in the public health area. It includes buildings considered national heritage by IPHAN (National Institute of Historic and Artistic Heritage) and collections recognized by UNESCO as Memory of the World.

Seeking to enhance the preventive conservation actions already underway for institutional heritage, and following the principles defined by the Preservation and Management Policy of Cultural Collections in Science and Health, the Casa de Oswaldo Cruz (unit responsible for the preservation of the cultural heritage of Fiocruz) developed a medium-term program for implementation of risk management plans for heritage located in Manguinhos. An interdisciplinary working group was created, composed of experts responsible for the conservation of different types of collections and the built heritage, as well as representatives of the management areas of the unit.

For the development of the work we adopted the CCI-ICCROM-RCE Risk Management Method (Canadian Conservation Institute - International Centre for the Study of the Preservation and Restoration of Cultural Property - Netherlands Institute for Cultural Heritage) and an expert was hired as a consultant to guide the work of the group. The methodology consists of five sequential steps: establish the context, identify risks, analyze risks, evaluate risks and treat risks.

For the development of the research, a range of surveys was held seeking to characterize: the institutional context; the set of actors who have influence and interest in the conservation of heritage; the teams of employees who work in the management and preservation of buildings and collections; the existing policies and procedures; the valuation of the ensemble; and natural and anthropogenic features of the site. Threats related to fire, urban violence, high pollution, susceptibility to climate change and landslide were some of the issues mapped during the process. This information was crucial for the development of a joint risk assessment, which resulted in a holistic view of different types of risks for the buildings and collections and a comprehensive understanding of the most critical and emergency.

This paper aims to present research results and discuss strategies to mitigate the identified risks, considering the diversity of types of cultural heritage under the responsibility of the institution.

National Strategy and Regional Reality: A systematic approach to disaster preparedness and recovery for cultural property

Erika Hedhammar, Advisor, Swedish National Heritage Board; Lisa Nilsen, Advisor, Swedish National Heritage Board

For several decades, the Swedish National Heritage Board (SNHB) provided information regarding fire protection and disaster recovery through publications and conferences. Several fires in buildings of both national and regional cultural importance, as well as floods and spectacular thefts, have high-lighted that such information needs to be better disseminated, and implemented by fire authorities, insurance companies, property managers and other stakeholders.

In 2006, less than ten years ago, a more systematic approach was taken. A national cross-sectional network on disaster preparedness and recovery for cultural heritage, chaired by SNHB, was established. Today the Network for Fire Safety and Cultural Heritage it is a functioning network, including organisations such as the Swedish Civil Contingencies Agency, the Kammarkollegiet (agency for government indemnity), the Swedish Property Authority, the Church of Sweden, several national museums, the Swedish Fire Protection Association, and the Swedish Insurance Salvage Organisation. An online handbook with practical checklists was created by SNHB with a cross-disciplinary reference group. A SNHB national coordinator is observing and collecting information from different disasters, and contributes to national and international disaster preparedness networks. SNHB is working towards the inclusion of cultural heritage in risk management and disaster planning in general, which is especially relevant due to the current national and international focus on climate change. One example is the European Flood Directive where cultural heritage is one of four main aspects. In line with the Hyogo framework for action and the upcoming Sendai Framework for Disaster Risk Reduction, SNHB has been a member of the Swedish National Platform for disaster risk reduction. In addition, SNHB distributes information regarding risks in other arenas, for example at conferences on fire fighting.

This paper will present the challenges of implementing national strategies at a regional and local level. These strategies are constantly put to the test, for example in 2014 during a forest fire which threatened the World Heritage Site Engelsberg's Ironworks and several churches, or during extensive flooding on the Swedish west coast a couple of weeks later, but also during minor accidents. These disasters high-lighted the importance of the existing networks and the protection of cultural heritage within the affected areas was high on the agenda from the very start.

Interviews were conducted with museums and archives, as well as with the Church of Sweden, where the national strategy has been implemented. Which arguments did they use to succeed? How was information received by stakeholders? How were resources used? Did there need to be an accident/incident before measures were taken? Replies show that the keys to success are quite down to earth; defined leadership, a systematic approach and making disaster management an integral part of the daily operation. Finally, we consider the role of the enthusiastic individual, those persons with an intimate interest in the cultural heritage at stake – is a disaster plan ever made without their initiative?

Rock Art Before Natural Disasters

Cesar Maguiña Gomez, Presidente, Instituto Americano de Investigacion y Conservacion (President of Investigation and Conservation American Institute)

The Niño Phenomenon is considered one of the most destructive natural disasters around the world that directly affects the northern coast of Perú. The events of 1983 and 1998-1998 have seriously affected the physical structures of rock art and this damage is irreversible.

Since the colony until present times there have been around 33 Niños, recorded since 1,100 b.c. until 1997-1998; therefore, influencing and transforming the cultural process of ancient inhabitants (Native and Spanish records referred to the catastrophic rains of 1578 in Trujillo and Zaña). This information evidences the destruction that the Niño caused in the cultural heritage, specially in rock art due to their permanent contact with the environment plus the damage produced by humans who use the rocks with great cultural value as protection to river overflows. There is very little interest of public institutions and cultural-archeological organizations for the preservation of rock art. This high cultural value is not really understood as cultural heritage of mankind.

For its preservation it is necessary to formulate a management plan for the preservation, protection and administration of rock art in its different varieties that may lead to control the environmental effects caused by physical, chemical and biological factors and lessen the damaged caused by man and the weather.

The present conditions of rock art makes it necessary the creation of preventive conservation programs of global and integral character of short and long term goals applying policies of conservation and cultural development using contemporary technological tools as well as multidisciplinary policies of sustainable development that promote economy through tourism without harming the rock art sites with the commitment of national and international organisms for its execution.

Risk Management in the Regional Museum of Anthropology Palacio Cantón in Merida

Laura Hernández Peña, Conservator-Restorer of the Regional Museum of Anthropology Palacio Cantón in Merida, INAH; Diana Ugalde, Conservator, Regional Museum of Anthropology Palacio Cantón in Merida, INAH

Risk management in the field of cultural heritage is essential to ensure the proper conservation and preservation of cultural objects. In the Regional Museum of Anthropology Palacio Cantón in Merida, Mexico, thanks to its young conservation and restoration department, has been designed an essential document determining the risks to which the collection is exposed. As a first step, were identified different types of agents of deterioration that threaten the objects, including natural, physical, environmental, organizational / management and operation agents. As a result were designed plan of action in 5 Steps to respond to disaster (hurricane, flood, fire, theft) and a draft preventive conservation plans that have created monitoring and control of environmental conditions and biological attacks. In this case, the conservation of cultural objects is directly related to the building that houses the museum's collections, understand the systemic relationship of container and content is paramount in this case the source detected a problem as the original destination, it is say this space created in the early twentieth century, was not designed to house a museum or to protect a collection of nearly 20,000 objects that are part of the cultural heritage.

Lighting a Fire: Initiating an Emergency Management Program

Rebecca Fifield, Preservation Consultant, Rebecca Fifield Preservation Services

Emergency preparedness is a critical part of collections stewardship, but the most challenging part can be getting started. Too often, cultural institutions plan in reaction to a disaster. Preservation professionals are often contacted to recover collections after a disaster, rather than serving as proactive institutional partners in planning. Preservation professionals must learn to be persuasive advocates to initiate and sustain an emergency preparedness effort as part of our commitment to preventive conservation. This session offers the preservation professional tools for gaining a seat at the planning table and transforming good intentions into a robust emergency management program. The discussion will include developing and communicating your vision for an institutional program, identifying and building relationships with allies, crafting influence strategies, and educating administration about the need for a comprehensive plan. Resources that help foster a culture of preparedness and collect data to support your cause will be highlighted. The audience will learn to develop strategies to overcome institutional hurdles to preparedness and advocate for an ongoing planning budget. Maintaining the

momentum is crucial. Ideas for keeping both administration and staff invested in supporting the emergency management program will be discussed.

Disaster Plan in Greece

Maria Lyratzi, Conservator, Pedagogical Institute; Ioanna Adamopoulou, Archaeologist-Museologist, Ministry of Culture; Kassiani Plati, Historian-Museologist, Peloponnesian Folklore Foundation "V.Papantoniou"; Stella Pateli, Archaeologist-Conservator-Museologist, Georgia Georgiou, Archaeologist-Museologist, Ministry of Culture

Disaster preparedness in Greek cultural institutions is now becoming an important consideration and steps are being taken to understand the current strategies and improve prevention, preparation, and response. Until recently, disaster prevention has not been a mandate of heritage collections management in Greece. Research, training programs, and resources are being established in Greece, based on systems like American Institute for Conservation Collections Emergency Response Team (AIC-CERT) and other international programs. Greece is a county at risk for many types of disasters, regularly experiencing wildfires, earthquakes, floods, and building mechanical failures. A brief history of documented consequences of disastrous events such as flood, earthquake and fire in Greek cultural institutions and archaeological sites from 2002 – 2012 will be presented. This research is based on information provided by the Hellenic Statistical Authority (EL STAT).** Research* has been completed that identifies the degree of disaster readiness of Greek cultural institutions. The research, similar to the Heritage Preservation's Heritage Health Index, took the form of a questionnaire and was sent to museums, libraries, and archives. The aim of the study was to investigate both readiness and strategies for cultural institutions to deal effectively with a catastrophic event. This study identified the number of Greek cultural institutions with formal written disaster plans and reviewed the roles and preparedness of staff to implement measures in protect institutional collections in case of natural, man-made, or accidental disasters. The study revealed that 75% of Greek institutions did not have a disaster plan.

This survey provoked national awareness on this important topic. A national 4-day seminar was cooperatively organized "Disaster Plan in Cultural Foundations of Greece." This seminar was organized by the Eugenides Foundation in collaboration with the American School of Classical Studies at Athens, the Technological Educational Institution of Athens, Institute for Educational Policy, and the American Embassy and was co-taught by American and Greek specialists. This was the first seminar on disaster prevention and recovery and the training was similar to the AIC-CERT training, but adapted to the available resources and culture of Greece. 150 Participants included Museum Directors, Managers, Curators, and Conservators from many types of institutions, took part on this seminar. The seminar informed managers and staff both theoretical information and practical experience so that each organization had a foundation of knowledge to be able to prepare their own plan. The study has sparked interest in additional research and the results are being used to design new effective strategies, in preparation, prevention and response to disasters.

*Research done by G. Georgiou, I. Adamopoulou, V. Mellisourgaki and M.Lyratzi

** Research done by M. Lyratzi, S. Pateli and K. Plati

Renovating the Disaster Preparedness Plan of the Renovated Rijksmuseum in Amsterdam

Idelette van Leeuwen, Head of paper conservation, Rijksmuseum Amsterdam

With the upcoming reopening of the Rijksmuseum in Amsterdam after a 9-year renovation in 2013, a review of the disaster preparedness plan was necessary. The disaster plan of the museum was over 10 years old and although it functioned well, the prospect of moving back 8000 objects into new and unfamiliar showcases, with new hanging systems in a changed museum building with many new members of staff, was not to be under estimated. The basic concept of the old plan was simple: Any damage or possible damage to the collection is reported to the so-called collection coordinator on duty. The collection coordinator being a member of staff with knowledge of art handling, knowledge of the museum organization and the ability to stay calm in stressful situations.

The new plan: A clear definition between 'incident' and 'calamity' was introduced to make the organization more effective in moments of stress during unusual events such as the rescue of damaged or endangered art. An incident is defined as an event that can be managed by the staff of the museum and the normal state of affairs in the museum can continue with only minor disruption. If the rescue operation can not be managed by the staff and/or the state of affair has to be interrupted, it is called a calamity and the crisis team is mobilized. This gives the collection coordinator on duty the authority to act quickly and is therefore more efficient. If the situation can't be handled with the people available it also creates the possibility to 'upscale' the rescue operation quickly. In the months before the reopening around 80 new members of the security staff received an in company training. Half a day of the course was reserved for the prevention, and reporting and assisting in the first recovery. Over 80% of all incidents is first noted by members of the security staff. Raising the awareness of the security staff is vital to the success of any disaster plan. A new registration system of incidents and calamities to the collection was introduced: code yellow.

Collection coordinators were trained to prepare for the new situation, for example how to open show cases in case of an emergency and evacuation of objects. Looking back at the first year: Record breaking visitor numbers showed that some of the routes in the galleries were too crowded and therefore a danger to objects and people.

The introduction of an annual report and evaluation of all incidents combined with recommendations for improvement

proved to be effective. Challenges for the future: Better relationships with local authorities are to be established. Extreme weather conditions in the summer of 2014 showed the museum's vulnerability. A new risk assessment on this specific risk was carried out. Implementing the advised improvements based on risk assessment of a recently renovated building are not easy to sell. Keeping the constantly changing security staff well trained proved to be a challenge too, designing a program of exercises and drills is in progress.

The World Goes "Pop": Planning for Emergencies at TATE

Louise Lawson, Conservation Manager, Sculpture and Time Based Media, Tate; Deborah Potter, Head of Conservation, Tate

Developing emergency planning within the Collection Care Division at Tate has focused on a risk based approach linking directly to the Collection Care principles and policy. Over the last three years there has been a comprehensive review of the emergency planning provision to ensure that it meets current demands of the modern world and Tate's Collection. This focus has been on preparedness and this paper will look directly at our emergency plan. This paper will outline our approach to modernising the emergency plan, ensuring it is appropriate for Tate's Collection and how we operate as an organisation.

It will demonstrate the intentional move towards a holistic approach that fits within the wider national and international context. The approach has spring boarded from developing a framework for planning along with a framework for the plan itself. This has resulted in the creation of a solid foundation of knowledge, developed in collaboration with internal and external partners. Internal partners have included Facilities, Library, Archive, Registrars, Conservation, Photography and Art Handling. External partnerships have included universities, emergency planning professional (UK wide-provision) and other cultural organisations. Tate is based across multiple sites, with collections and staff across 6 sites in the United Kingdom, also collections on loan and tour at international venues. The complexity and frequency of our programme for acquisitions, displays, exhibitions, loans and touring, presented a challenge when planning for emergencies. There is constant movement and change of artworks, moving on a daily basis.

Critical for us is how to ensure the emergency plan would be relevant, current, flexible and responsive. The next step in our process is to further develop our emergency training provision, preparing for our response. We have undertaken research into the use of the virtual world and environments as a training platform. We are exploring methods of delivering training across multiple sites, to large numbers of staff across these sites and how to ensure consistency and quality of provision, in a cost-effective sustainable way. The paper will share our approach and enable wider discussion of the framework and plan we have developed within the conference.

Vermont Prepares!

Eva Grizzard, Preservation Specialist, Northeast Document Conservation Center; MJ Davis, Paper Conservator, WASHI

In 2014, the Vermont Historic Records Advisory Board (VHRAB) successfully obtained a grant to provide emergency preparedness training for cultural heritage institutions across the state. Called Vermont Prepares, this series of workshops and consulting was funded by the National Historical Publications and Records Commission and the Vermont Humanities Council. VHRAB partnered with the Northeast Document Conservation Center (NEDCC) to present a series of 5 regional workshops, with free follow-up consultations for workshop participants. More than 50 institutions took part in workshops and site visits over a three-month period, including historical societies, state offices, public libraries, museums, and college libraries.

The proposed session will discuss the benefits and challenges of a large state-level grant such as the Vermont Prepares project. Beyond the educational purpose, this training series provided a space for discussion and collaboration among regional institutions and professionals. This experience demonstrates that established regional groups might formally agree to assist one another in an emergency with both personnel and space, organize centrally-located depots where salvage supplies and equipment could be shared, and undertake further training sessions such as hands-on wet salvage workshops.

This presentation will highlight the successes of collaborative planning and resource-sharing, for public as well as private institutions. Representatives from the VHRAB and from NEDCC will co-present, explaining the process of designing and completing a successful grant, lessons learned from the workshop and from participants, and future plans based on this project.

IMALERT: Establishing the Iowa Museums, Archives, and Libraries Emergency Response Team

Nancy E. Kraft, Head of Preservation and Conservation, University of Iowa Libraries; Elizabeth Stone, Assistant Conservator, University of Iowa Libraries

In response to the catastrophic flooding of Cedar Rapids, Iowa in 2008, Nancy E. Kraft coordinated an informal but early response and salvage effort for three local institutions. Seven professionals were at the gate and ready to provide assistance when officials allowed citizens into the flooded areas. The impact of this effort was so great that it demonstrated the need for an organized team that had the ability and knowledge to respond to disasters rapidly within the state. With the support of Iowa Conservation and Preservation Consortium, and an Iowa State grant, Kraft trained a group of twenty-five geographically-distributed mix of staff from libraries, museums, archives, and other collecting organizations in best practices for emergency response. The training was developed and led by Consultant Barbara P. Moore

and University of Iowa Libraries Preservation Librarian Nancy E. Kraft, with assistance from University of Iowa Libraries Assistant Conservator Brenna Campbell, and University of Iowa Libraries Project Conservator Elizabeth Stone. Training comprised of presentations by Moore and Kraft, as well as contributions from representatives from FEMA, a commercial disaster recovery firm, the State of Iowa Homeland Security, OSHA, and an industrial hygienist. Hands-on activities and table-top scenarios were key to team building. Participants learned how to organize and manage a recovery operation, recovery techniques for the different types of materials in collections, and how to incorporate health and safety precautions. On completion of the course, participants received a disaster response trunk kit and personal protection equipment. Responding quickly to collection emergencies can minimize the cost and impact to the local community. Small institutions in particular often do not have the staff or financial capacity to respond appropriately to threats to their collections. Though local community members may provide most of the labor needed to salvage damaged collections, a trained expert provides the structure and guidance needed for community members to act quickly and in the best interest of their collections. The African American Museum of Iowa estimates that over 90% of their collection was salvaged due to the prompt response by the informal team in 2008. Because ongoing training to the Iowa collections emergency response team will be critical to its success and sustainability, IMALERT members must agree to attend annual training. The continuing education will serve to create a team camaraderie, ensure team member readiness, and develop a pool of future candidates to carry on disaster preparedness and collection salvage throughout the state of Iowa.

The Museum Flood Funding Program: the Alberta Museums Association's Response to the 2013 Alberta Floods

Owen Thompson, Flood Advisory Lead, Alberta Museums Association; Claire Neily, Flood Response Technician, Alberta Museums Association

Several museums in Alberta were affected by severe weather and floods in June 2013. The Government of Alberta demonstrated its commitment to supporting recovery in every affected area through its provincial recovery framework, and the Alberta Museums Association (AMA) was pleased to collaborate with Alberta Culture and Tourism to aid in the recovery of Alberta's heritage community through the Museum Flood Funding Program. The Program was designed to provide assistance to institutions either affected by floods in Summer 2013, or at risk of future riverine flooding. Since its launch in spring 2014, the Program has worked to minimize the short and long-term effects of the floods on museum collections by providing training opportunities, project funding, and basic disaster response tools. This session will provide a case study of the projects being undertaken by recipients of Program funds. The projects range from the creation of a disaster plan, to the facilitation of a full gallery space evacuation, to the retrofitting of offsite storage facilities. The AMA aims to support museums at all stages of organizational life, and in order to best aid in the delivery of these projects, a Flood Recovery Technician was hired to provide on-site consultation services for affected institutions. By highlighting the projects occurring in museums across Alberta, this session will provide concrete examples of response methods and institutional impacts in flood disaster situations, as well as demonstrate the impact of the Museum Flood Funding Program through the lens of increasing sector sustainability. The work completed through these projects ensures Alberta's heritage remains safeguarded and accessible for current and future generations, and the skills and knowledge gained will lead to a more resilient museum sector.

Lesson Learnt in an Emergency: Sorting channels for efficient actions

Céline Allain, Emergency response coordinator, Bibliotheque Nationale du France, BnF

The national library of France (BnF) underwent in January 2014 an important water leakage on the site François-Mitterrand, due to a pipe burst. Although firefighters on site react rapidly, already 25 cubic meters of water flowed into the closest storage rooms and through the expansion joints to the lower levels of repositories causing damages to 10 000 to 12 000 documents of the 19th and 20th centuries. The Emergency plan was quickly deployed involving a large staff to evacuate and dry the affected documents. The major challenge was to deal with large quantities of collections before the occurrence of an infestation. The dissemination of the emergency plan 'procedures since their inception in the year 2 000 helped the library staff respond quickly and thus limit the damage and side effects of flooding on the documents. The risk of development of micro-organisms was avoided at each step of interventions. But other difficulties arose which led us to take a second look at our procedures. Situations of congestion related to the management of large quantities of documents extracted of the affected repositories occurred in the drying rooms and led us to examine the relevance of our sorting chains. Sorting of documents applies when influx of damaged documents beyond the possibility of immediate treatment require a collective instead of individual use of resources. It consists in categorizing damaged documents for evacuations and for treatments. The three categories used where based on a quick look at the state of the documents: dry, wet or damp. These sorting channels were found insufficient to face the large quantity of documents and inappropriate as a criteria of choice in a decision process. In this process, coated papers or leather covers for instance which require immediate and specific actions could be at risk if not set apart. Instead sorting channels based on the constituent materials and their vulnerability appeared to be more efficient and immediately transposed in sheets of intervention. Sorting appeared to be a key step for the efficiency of the treatments and also a tool for the management of the teams.

Documenting Disasters: Post-Disaster Memory-Making and the Emergence of New Cultural Heritage

Valerie Marlowe, Doctoral Candidate, University of Delaware

Post-disaster, a variety of factors determine whether or not a particular event will become a significant part of the documented local historic narrative, and if so, what form that documentation will take. Media influence, cultural beliefs regarding death, dying, and treatment of the dead, indigenous knowledge of hazards and their impacts, and the influence of large international non-governmental organizations (NGOs) and the "heritage at risk" framework all have an impact on the process of post-disaster memory-making and the production of disaster-related cultural heritage. This production of culture allows for various outcomes including commemoration of events and veneration of disaster sites, highlighting of the vulnerability or heroism of certain segments of the population, thanotourism (or dark tourism), or even the slow the fading of an event from public memory. This confluence of factors not only influences the archivistic processes by which objects and documents are deemed important enough to salvage or preserve (or are conversely excluded from the cultural narrative), but also the formation and functioning of organizations that do the work of preserving post-disaster cultural heritage.

This paper explores lessons learned from fifty years of academic research on the post-disaster environment and further explores three relevant cases: the formation World Trade Center Documentation Task Force, the case of the "Tsunami Boats" following the 2004 Indian Ocean earthquake and tsunami, and the "Mud Angels" of the 1966 Arno River Flood.

Scaling-up First Aid for Cultural Heritage During a Complex Emergency: Lessons from Nepal

Aparna Tandon, Project Specialist & Coordinator of Disaster Risk Management Programme, ICCROM; Corine Wegener, Cultural Heritage Preservation Officer, Smithsonian Institution; Rohit Jigyasu, UNESCO Chair Professor, Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University, Kyoto, Japan

Why lose time in training when damage to cultural heritage is widespread and on the ground capacity for response is stretched thin? In the aftermath of the devastating earthquakes of 25th April 20 15, the Department of Archaeology in Nepal had to confront this question, as over one thousand cultural heritage sites had been affected and the less than 100 staff of the Department had to respond. In order to do so they had to enlist the help of civil engineers, craftspeople and local residents while coordinating operations with Nepal army, police, and municipalities, as they were providing the necessary resources for humanitarian as well as cultural assistance.

This paper describes the experience of an intensive field training organized in the aftermath of the earthquakes in Nepal. It explains how this "just in time" training helped prepare a national team of cultural first-aiders capable of leading the assessment, stabilization and security of damaged heritage in order to promote early recovery. Organized at the invitation of Nepal's Department of Archaeology, this initiative set a unique example of inter-agency cooperation for international cultural emergency response as ICCROM, ICOMOS-ICORP, ICOM-DRTF and the Smithsonian Institution joined forces to train a mixed group of over 40 heritage professionals, craftspeople and members of Nepal army and police. To prepare for on-the ground assistance, ICCROM and its partners had set up Kathmandu Cultural Emergency Crowdmap. The information gathered through the crowd-map helped develop a consistent situation analysis, and identify key public as well as private actors engaged in the protection of cultural heritage.

Through two workshops, participants developed tailored solutions and workflows for damage assessment, documentation, salvage, and stabilization for cultural collections and heritage buildings. Engaging the local communities in rescuing cultural heritage, identifying priorities for intervention, resource-mobilization and on-going risk management were some of the key issues that were addressed during the on-site work. Analyzing the outcomes of the training, the paper will identify broader strategies that could be applied to strengthen local responses in future disaster situations.

Emergency Preservation during Armed Conflict: Protecting the Ma'arra Museum in Syria

Corine Wegener, Cultural Heritage Preservation Officer, Smithsonian Institution; Dr. Brian Daniels, Director of Research and Programs, Penn Cultural Heritage Center, University of Pennsylvania Museum

In the past several years we have seen the destruction of cultural heritage around the world increase to a level not seen since World War II. We have witnessed irreversible damage to collections and sites in Mali, Libya, Egypt, Iraq, and several other countries. Amidst the atrocities of Syria's civil war, Syrian curators, heritage professionals, and activists courageously risk their lives to protect the country's cultural heritage. Working in areas outside of the Assad regime's control, these individuals have managed to safeguard collections salvaged from damaged museums, religious institutions, and looted sites. This paper will discuss the efforts of these colleague to learn emergency protection methods and successfully apply them in an actual conflict situation. Last year, a group of Syrian colleagues working in opposition controlled areas of Northern Syria met at a workshop in Turkey to discuss emergency response for cultural heritage in armed conflict. The workshop was organized by the Smithsonian Institution, the Penn Cultural Heritage Center at the University of Pennsylvania

Museum, and The Day After Association. The workshop focused on emergency documentation, crating and packing, evacuation, and temporary storage, along with methods for protecting objects in situ. Participants were provided with equipment and supplies for their work back in Syria. Their projects included protection of the Ma'arra Museum in Idlib Province. The historic caravanserai holds a magnificent collection of well-preserved Roman and early Christian mosaics and has suffered collateral damage from aerial barrel bombings and repeated attacks from Jihadi militants. The emergency protection project aimed to secure the mosaics from further harm during the conflict. Altogether, some 1,600 square feet of mosaics were protected with facing and sandbags. The effectiveness of this work was proven in June 2015, when a barrel bomb severely damaged the museum building. The sandbag barriers held, protecting the mosaics and providing a positive example of protective efforts for other sites at risk in the future.

The Iraqi Institute: Conservation's role in disaster preparedness, recovery and long-term redevelopment

Jessica Johnson, Head of Conservation, Smithsonian's Museum Conservation Institute

Iraq has suffered decades of war and sanctions, the most recent being the incursions of the Islamic State in Syria and the Levant (ISIS). In Iraq, as in many other countries, governments have funded conservation and other types of heritage programs in order to support the country and its internal institutions. The Iraqi Institute is a successful example of a longer-term approach to capacity building through educating individuals working in the heritage community in Iraq. After a crisis (earthquake, flood, terrorist attack, war) quick response and recovery are necessary to ensure preservation of as much of a community's cultural heritage as possible. Redevelopment is a much longer process that requires commitment and development by individuals and institutions to ensure long-term improvement in skills of the community, preservation of heritage, and funding. Conservation can be part of the redevelopment process by building bridges between communities by focusing on history, improving skills together, and education about the larger world of heritage professionals. The Iraqi Institute for the Conservation of Antiquities and Heritage was initiated in 2009 through a grant from the US Embassy in Baghdad. Since then, it has expanded into a well-appointed building with conservation teaching labs, dormitories and classrooms. It is supported by a Board of Directors drawn from heritage experts from Baghdad and Erbil. It has an international Advisory Council drawn from individuals in the US and Iraq who have dedicated years of their support to finding was to make the Institute a sustainable entity in a country that is still struggling to rebuild and define itself in the current world. The successes of the Institute can be defined by the community that has been built. A collection of people who have a great love of their heritage and a fierce desire to learn how to take care of it. This is a group of students who come from all across Iraq – Kurdish, Arab, Christian, Muslim, male, female. These people, supported by their institutions, came to the Institute from across the country to learn how to preserve their heritage.

Reverse Engineering Ancient Greek Ceramics: An Interdisciplinary Collaboration

Sanchita Balachandran, Curator/Conservator, The Johns Hopkins Archaeological Museum; Matthew Hyleck, Potter and Education Coordinator, Baltimore Clayworks; Patricia McGuiggan, Associate Research Professor, Department of Materials Science and Engineering, Johns Hopkins University

This project addresses the 2500 year-old enigma of how the ancient craftsmen of Greece developed the artistically and technologically superior corpus of objects known as red figure ceramics. Manufactured between the 6th and 4th centuries BCE, and perfected by potters and painters in the ancient Kerameikos, or ceramics quarter of Athens, the original manufacturing processes of these vessels continue to elude scholars. In Spring 2015 at Johns Hopkins University, the undergraduate course "Recreating Ancient Greek Ceramics" brought together artists, art historians, archaeologists, art conservators, materials scientists and college students to consider how these objects functioned in antiquity. A key concern of the course was to integrate recent materials science research into the process of examining ancient red-figure cups from the Johns Hopkins Archaeological Museum's collection, and to use these observations to guide the making of contemporary ceramics in collaboration with a master potter. As part of this process, thirteen undergraduate students—from backgrounds as diverse as biomedical engineering and materials science to archaeology, classics and studio art—worked alongside conservator Sanchita Balachandran and potter Matthew Hyleck to recreate every stage of the manufacturing process. To this end, we threw cups based on extant examples, levigated clay to make slip for painting, built a replica of a Greek updraft kiln based on excavated examples, and fired our replica kylikes in an 11 hour firing cycle in an alternately oxidizing, reducing and then oxidizing environment. These processes were extensively documented on the museum's website (http://archaeologicalmuseum.jhu.edu/the-collection/object-stories/recreating-ancient-greek-ceramics/), results were shared through a film that documented the experience ("Mysteries of the Kylix"), and three segments about the course were broadcast on the local National Public Radio station. The course provided insights into the gestures and muscle memory essential for successful potters and painters, the complexity of workshop organization, and the difficulty of producing high quality wares for a mass market, as was the case in antiquity. The products of the first firing were also uneven, but encouraging, raising numerous technical questions that remain unanswered in the growing materials science literature on ancient Greek ceramics. Two specific areas of manufacture—the preparation and physical characteristics of slip (thinned and levigated clay), and the sequence of firing stages which produced juxtaposed lustrous black and matte red surfaces—still remain a matter of intense debate. With a Johns Hopkins University Discovery Grant, awarded in July 2015, the research on ancient Greek ceramics has taken on a new dimension, that of supporting a collaborative and interdisciplinary research project combining the expertise of a conservator, a potter, and a materials scientist (Patricia McGuiggan). All three experts bring particular perspectives on the material properties of clay, and on the production processes of ceramics.

This paper highlights insights gained on ancient Greek ceramics as a result of this truly collaborative approach, following the work of analyzing ancient ceramics and the recently made replicas, and using this information to reverse engineer the ancient production processes.

Looking at Guilloche Work in Conservation

Brittany Nicole Cox, Horological Conservator, Memoria Technica; David Lindow, Clockmaker; David Lindow Clockmaker

Guilloche, also referred to as engine turning, is work produced on a rose engine or straight-line engine. The rose engine was developed in the 16th century, but found wide scale popularity in the early 19th century when Breguet applied the craft to augment his watch dials, cases, and movements. Many believe it reached its apex with Fabergé. Developing a conservation methodology for Guilloche work appears to be a relatively new subject and understanding the processes by which an object was made or decorated may be the first stage in development. Little information is widely available on the enigmatic rose engine and even less is available on the process by which its patterns are created. We will briefly explore the history of these machines and their various uses through examining the steps required for accomplishing distinct patterns and looking at some of the diverse objects that employ them. The reflective quality of Guilloche work along with the effects of oxidation on this property will be examined. Through this we will identify various pitfalls in the practice of cleaning and repair. The rose engine was employed not only in horology to decorate metal objects of art, but also in other media such as pottery by Josiah Wedgwood and modern plastic injection molding patterns. As these machines were used from the early 16th century through the present, many conservators are likely to encounter objects that were either made or decorated by them. This session will seek to aid in the development of a conservation methodology for treating and working with engine made or decorated objects.

When in Rome, do as the Romans do? The Conservation of an Italian Marble and Micromosaic Tabletop

Elizabeth La Duc, Objects Conservation Fellow, The Straus Center for Conservation and Technical Studies, Harvard Art Museums

A nineteenth-century Italian marble tabletop featuring micromosaic scenes of Rome was the subject of technical study and conservation treatment. The tabletop, part of the collection of

Historic New England, is elaborately decorated with two distinct techniques: inlaid colored stones, also known as commesso di pietre dure or Florentine mosaic, and micromosaics, an art form developed in Rome. The tabletop was in poor condition, having broken into four large pieces with many areas of loss along the breaks, and required extensive treatment before going on display in the recently reinterpreted Josiah Quincy House in Quincy, Massachusetts.

Pietre dure and micromosaics have not received much attention in the conservation literature, with the exception of research by the Opificio delle Pietre Dure (OPD), the conservation institution in Florence which itself grew out of the Grand Ducal workshops that made the finest examples of pietre dure. In order to remedy the shortage of information, the materials and methods of manufacture of these two techniques were investigated using both high-tech and low-tech means, including FTIR (Fourier transform infrared) spectroscopy, microchemical testing, photomicrography, and art historical research.

The treatment of the tabletop raised many questions regarding best practices. Traditional treatments, such as those practiced by the OPD, often involve filling losses with the same materials as the original – i.e. cut decorative stone and glass tesserae. The methods were neither possible, given the lack of appropriate materials, nor desirable, given the preference for distinguishability of replacement materials. Instead, losses to the pietre dure were filled with bulked and tinted epoxy. Innovative techniques were developed to replicate the complex appearance of colored stone as well as to increase reversibility. As an alternative to using glass or epoxy tesserae, the losses in the micromosaics were filled then inpainted using novel methods to replicate the complex appearance of the tesserae. In addition to these alternative treatments, some traditional practices were determined to be the most satisfactory and appropriate. After testing and discussion, methods such as using fine abrasives to polish out scratches and coating the table with wax to restore gloss and saturation were used to complete the treatment and prepare it for installation in a historic house museum.

An Unexpected Surface: Research and treatment of a 19th century mounted oyster shell by Froment-Meurice

Emily Brown, Project Conservator, University of Pennsylvania Museum of Archaeology and Anthropology

An oyster shell set into a delicate gold, silver, and gilt-silver metal mount belonging to the Walters Art Museum required treatment. Made in the late 1870s in Paris by the celebrated goldsmith firm Froment-Meurice, the object was damaged and heavily tarnished. Analytical testing and literature research indicated that the silver components may, in part, contain an originally applied patination layer (oxidized silver or argent noir). Since intentionally patinated silver surfaces are rare in museum collections and literature resources are scare, it was decided not to polish the silver components, while the object would be cleaned overall and tarnish reduced only on the gilt-silver and gold components. After careful testing, an acidified thiourea solution made with sulfuric acid and gelled with xanthan gum was used to reduce the tarnish on the delicate gold and gilt-silver components. The formulation of the gel allowed for an extremely controlled application, and treatment resulted in a bright, shiny surface for the gilt-silver and gold metal, which required no additional buffing or polishing. The intent of this paper is twofold: first, it will present current research, resources, and further avenues to investigate oxidized silver within the context of the Froment-Meurice workshop; and second, describe an efficient, highly controlled method to chemically reduce tarnish on delicate gold and gilt-silver surfaces.

Acne Gel for Green Ear Syndrome? A study on copper corrosion stain removal from poly(vinyl chloride)

Dawn MP Wallace, Objects Conservator, National Museum of American History; Aaron N. Shugar, Andrew W. Mellon Associate Professor of Conservation Science, SUNY, Buffalo State; Jonathan Thornton, Professor of Objects Conservation, SUNY, Buffalo State; Rebecca Ploeger, Assistant Professor of Conservation Science, SUNY, Buffalo State

The removal of copper corrosion stains from plasticized poly(vinyl chloride) are of concern to both conservators and the collectors of popular vinyl dolls. Early Barbie™ dolls in the 1960's and 1970's were sold with earrings inserted into the ear, and Dawn® dolls sold in the early 1970's featured bendable knees with internal metal and dense plastic armatures. These components are comprised of copper alloys which over time may create corrosion stains on and within the plastic. The conservation field is still relatively hesitant to implement invasive treatment of plastics, while public collectors are actively trying treatment methods to reduce the staining. Currently the most common method used by collectors employs common over-the-counter acne topical gels.

Two acne topical gels were tested using methods described by private collectors to determine the effectiveness and any potential irreversible damages caused by these removal methods of the corrosion staining. Neutrogena® gel contains salicylic acid as the primary acting compound and the other by Clearsil® contains benzoyl peroxide. Normal and fluorescence induced illumination documented the visible change of the samples during testing. The samples were weighed to determine possible loss of plasticizer or material. X-ray fluorescence spectroscopy (XRF) was employed to follow movement of the stain by presence of the copper αβ K-lines. It was determined the salicylic acid gel removed copper from the sample while the benzoyl peroxide acted primarily as a bleaching agent. Pyrolysis- Gas Chromography-Mass Spectroscopy

(py-GC-MS) was also used to characterize the PVC samples, gels and removed residues to determine the materials extracted during the tests.

The Use of Gums and Resins in Archaeology and Microchemical Tests for their Identification

Christina Bisulca, Research Specialist, Arizona State Museum; Marilen Pool, Project Conservator, Arizona State Museum; Nancy Odegaard, Head of Preservation, Arizona State Museum; Werner Zimmt, Museum Fellow, Arizona State Museum

A survey of approximately 150 artifacts with resinous materials or residues at the Arizona State Museum were characterized using multiple techniques including UV examination, micro-chemical tests, and Fourier transform infrared spectroscopy (FTIR). A special focus was placed on micro-chemical testing, which is an invaluable tool in conservation as often analytical instrumentation is not available. Especially useful was a reevaluation of the o-toluidine test, which can distinguish between gum/mucilage and starch. A new test was developed to confirm the presence of unprocessed lac based on the color change of dyes in the resin in the presence of alkali. The study identified problems encountered with each technique that may lead to misidentification. As part of a Save America's Treasure Grant, basketry, sandals, wood artifacts, bows, arrows, textiles, cordage, vegetal artifacts, and botanical specimens representing 2000 years in the US Southwest were identified. Those with resinous material were selected for further examination and analysis. The peoples of the southwest used a variety of organic materials including pine resin, plant carbohydrates such as mesquite gum and mucilage prepared from cacti flesh and roots, and creosote lac (a resin exuded from the insect Laccifer larrea that is similar in composition to shellac).

This study found that resinous materials are often misidentified and the terminology is inconsistent in the archaeological, ethnological and ethnobotanical literature. Consequently, museum records are often erroneous. Results from the collaborative work of conservators and conservation scientists identified regional differences in the use of various gums and resins. These differences reflect different environmental regions. Also, there is evidence that cultural groups within the regions utilized and processed resinous materials in different ways possibly reflecting cultural traditions or trade.

Conservation of Joan Miró's Bronze Sculptures at the Museum of Modern Art

Megan Randall, Conservation Fellow, Museum of Modern Art; Lynda Zycherman, Sculpture Conservator, Museum of Modern Art; Roger Griffith, Associate Conservator, Museum of Modern Art

Joan Miró was one of the most eminent and prolific artists of the 20th century. The Museum of Modern Art's Miró holdings include three of the most important bronzes in MoMA's collection: Lunar Bird and Solar Bird (both edition 2/5) cast in 1966 at the Susse Foundry in Paris, France, and Personage and Bird (edition 1/2) cast in 1968 at the Parellada Foundry in Barcelona, Spain. While the Susse Foundry was able to engineer large-scale versions of earlier maquettes, Parellada Foundry provided an outlet for Miró's artistic experiments. Unlike the smooth-formed sculptures cast at the Susse Foundry, the Parellada sculptures are smaller in scale and are cast from assemblages of found objects. All three works were produced as multiples—therefore, information pertaining to their production technique, metallurgical and patina composition, condition, and appearance is applicable to numerous other Miró bronzes in other collections. Given that casting techniques and alloy recipes tend to remain consistent within foundries; this research is relevant to bronzes cast by other artists at the Susse and Parallada foundries during this time period including Henry Moore, Jean Arp, Fernando Botero, and others. Lunar Bird and Personage and Bird were both acquired by MoMA in 1994. Shortly after its accession, Lunar Bird was installed in the Museum's sculpture garden, where it is currently on view. The work has required only minor treatment to address surface scratches and touch-ups of patina, and the sculpture remains in good condition. Personage and Bird went directly into offsite storage. In August 2014, severe surface delamination was discovered when the object was uncrated for photography. MoMA acquired Solar Bird from the Cigna Corporation in 2005. Years of outdoor exhibition and lack of maintenance had significantly altered the surface and patina of the sculpture. Solar Bird remains in the Museum's storage facility. While Lunar Bird and Solar Bird were brought into the museum from different collectors, they could reasonably be viewed as a pair, given that they are both 1966 casts from Susse Foundry. A comprehensive comparison of surface, patina, structural concerns, and metallurgical content reveals their similarities and differences. Personage and Bird is unique in the Museum's Miró holdings—the work's size, appearance, condition, and casting method differ considerably from the Lunar Bird and Solar Bird, offering a wider view of Miró's bronzes. Scientific analysis of the alloys and patina in combination with research into the casting methods and other editions informs maintenance, treatment, and preventive care for these three objects. This presentation will review the results from the documentation and analysis of the sculptures, including photogrammetry, x-ray fluorescence, x-radiography, and scanning electron microscopy. Other editions of these sculptures will be discussed and comparative metallurgical and visual documentation will aid in understanding the condition and treatment goals of MoMA's objects. Finally, research into both the casting methods and alloys of the Susse and Parellada foundries and the art historical study of Miró's sculpture making will allow for a fuller understanding of these objects within Miró's oeuvre and 20th century bronze casting techniques.

Conservation and Investigation of Ancient Bodies at Abydos: Challenging work in post-revolutionary Egypt

Lucy-Anne Skinner, Principle Investigator, Conservation of Bio-Archaeology, NY-IFA Archaeological Project, Abydos; Daniel Doyle, Conservator, Parks Canada; Mohamed Ahmed Ibrahim, Conservator, Egyptian Museum of Antiquities

Excavations during the spring of 2012 at the North Cemetery at Abydos were eventful, with many chance finds discovered, including some beautiful furnished burials from the Middle Kingdom (around 1800BC) requiring urgent conservation intervention. It was one year after the January 25th revolution and tensions were high on site. The possible threat of illicit looting of the site for antiquities forced the archaeologists to keep work low-key while ensuring that methods used were as transparent as possible – in order to not provoke rumours or attract too much attention from the local villagers – and to satisfy the concerns and wishes of the Ministry of Antiquities authorities.

This paper will focus on two human burials discovered buried at the base of a giant sand dune in the North Cemetery. We will describe the conservation process, and how we managed to achieve our goals in a very challenging working environment. Due to remarkable natural preservation of hair, flesh and skin on the bodies, and textile wrappings encasing them, careful planning was necessary to find a method of maintaining the bodies intactness during and after excavation. A creative technique was employed for block-lifting the complete burials. Following transfer of the block-lifted burials, within wooden crates, to the onsite magazine in Abydos, they remained in storage until May 2015 when a grant from the American Research Center in Egypt allowed a small team to return to Abydos and continue the treatment and investigation. This was the second phase of the project, which took place in the midst of continued security fears, permit delays and limited access to the storage magazine.

This next step in the conservation process involved inverting the crates to allow treatment of the bases of the two wooden coffins beneath the bodies. Once the underside of the coffins had been conserved and supportive mounts constructed, the crates were turned upright once again, the sides of the crates and cushioning materials removed – exposing the bodies for the first time since excavation. Careful planning was essential to ensure we had sufficient materials on site for the conservation treatment. Nevertheless, because of the difficulties we faced importing or purchasing conservation grade materials in Egypt (even in Cairo), it was sometimes necessary to substitute imported supplies (such as adhesives for constructing the supportive backing of the burials) with local alternatives. Final conservation of the bodies and remaining coffins will be finished before the summer of 2016, in addition to the investigation, analysis and documentation of the project, allowing us to begin preparing the final publication. The project was ambitious in its aims, striving to demonstrate what it is possible to achieve with determination and resourcefulness – in a country where the logistics of working are becoming increasingly difficult.

Using Heat and Cold in the Treatment of a Lakota Winter Count

Nancy Odegaard, Conservator - Professor, Head of the Preservation Division, Arizona State Museum - University of Arizona; Madeleine Neiman, Project Conservator, Penn Museum; Dave Smith, Adjunct Conservation Scientist, Arizona State Museum

This paper explores the application of a temperature-based treatment methodology. Specifically, it examines how heat and cold were successfully utilized in the conservation of a Lakota winter count. While conservators have employed elevated temperatures in the active treatment of objects, the use of low temperatures has been largely unexplored.

Work carried out by Arizona State Museum (ASM) conservators indicates that both temperature extremes can be used to manipulate material properties in advantageous ways. The use of cold should not be overlooked when considering treatment options. Winter counts, pictorial calendars/histories, were traditionally fabricated using mineral pigment on a hide support. During the late nineteenth-century, commercially available media as well as paper and cloth substrates increasingly replaced traditional materials. The nineteenth-century winter count at the center of this study was drawn on the reverse (textile) side of a commercially manufactured oilcloth tablecloth. At some time after the application of the pictographs, the object was folded in half with the applied oil surfaces facing each other. While in this configuration, the count was subjected to disastrously high storage temperatures causing the oil-coated surface to soften and adhere to itself. Subsequent attempts by non-museum personnel to un-fold the object resulted in tearing of the coated textile. Testing carried out at the ASM conservation lab found the use of lowered and elevated temperatures allowed for the effective and efficient treatment of the object. The aged, the cross-linked oil coating was largely unaffected by solvent.

However, when the temperature of the surface coating was lowered using a Peltier cooler, the applied coating became increasingly embrittled allowing the fused surfaces to be cleaved along the plain of contact through mechanical action. Conversely, experimentation found that tears in the fabric were best stabilized using a heat-seat adhesive. Lascaux Textile Welding Powder was employed to tack together fibers along tears holding together where traditional stich repairs or bulky patches could not be applied.

Facing the Past for Action in the Future: Cultural Survival in Native America

Kelly McHugh, Object Conservator, National Museum of the American Indian

The unimaginable devastation of both natural and man-made disasters in places like Iraq, Afghanistan, Haiti, Japan, Syria, and New Orleans mobilized the cultural heritage preservation community worldwide and generated international support. Media outlets provided a zoom lens to these tragedies, keeping them in the forefront of our minds. The shock at seeing thousand year old structures crumble to the ground due to terrorist activity, at the very minimum makes our stomachs turn. Organizations like UNESCO, the US State Department Cultural Heritage Center, the Smithsonian Institution and the American Institute for Conservation are dedicated to protecting and preserving the world's cultural heritage and have been critical in protection, recovery and preservation efforts. While these initiatives are vital and should be applauded I take pause in wondering what is going to happen in places like Haiti, Iraq or Syria when the allure of helping is over and the funding ceases to exist? This question is generated from my experience as a conservator at the National Museum of the American Indian. War, terrorism, and cultural disaster have affected Native people in our nation for over four hundred years. Buildings are crumbling in our own back yard, native communities are struggling but determined to protect, recover and preserve their cultural record. I have witness first hand the urgency Native people feel at the prospect of loosing their cultural material. Organizations like IMLS, NEH and the National Trust for Historic Preservation support community preservation initiatives, but perhaps the greatest mobilization is happening within Native America itself, through organizations like the Association for Tribal Archives, Libraries and Museums. This presentation will aim at highlighting the cultural crisis that exists in our nation as a result of the past disaster of colonization, and well-intended, but mis-guided interventions. It challenges us as a profession to think about our current and future actions. Outrage is justified at the activities happening currently in places of turmoil around the globe, but where is the outrage at the valuable heritage that is being lost here?

The Aftermath of Hurricane Sandy – Rescue and Treatment

Carolyn Tomkiewicz, Paintings Conservator, Private Practice; Caitlin Breare, Assistant Conservator, Paintings, Museum of Fine Arts, Boston

Although warned of the arrival of Hurricane Sandy on October 26, 2012, it was nonetheless a rude awakening for all New Yorkers who were unprepared for the magnitude of the disaster. On November 4th the Museum of Modern Art hosted a free presentation (1) by speakers from the American Institute for Conservation Collections Emergency Response Team along with conservators from MoMA. Focusing on "recovering wet art and cultural materials," the meeting brought together artists, collectors, and Conservators reaching out to one another for information and assistance in the aftermath of the storm. A united volunteer investment in recovery at the Westbeth Artist's Residence is one story among many across New York City. The basement storage that housed innumerable works by artists living in this residence as well as the Martha Graham Dance Company historic collection had been flooded by over 12 feet of water from the Hudson River along with overflowing sewage. AIC-CERT volunteers, resident artists and area Conservators provided services to support the rescue efforts. The proposed presentation for the 2016 AIC/CAC-ACCR joint meeting in Montreal, Canada intends to describe firsthand the salvage activities undertaken. The presentation further intends to describe the construction of a stretching device (2) based on a design by Prof. Winfried Heiber. The stretching device aims to restore planarity to paintings suffering severe shrinkage and undulations from direct water exposure. Two Hurricane Sandy related case studies along with one case study of water damage due to roof leakage would be used to elucidate the efficacy as well as limitations of the stretching device.

1. A free public presentation on recovering wet art and cultural materials will be held Sunday, November 4 from noon until 2 p.m. at The Museum of Modern Art. Speakers from the American Institute for Conservation Collections Emergency Response Team (AIC-CERT), along with conservators from MoMA, will provide suggestions and answer questions on how to safely handle and dry wet materials such as paintings, drawings, books, sculpture, and other artistic and cultural works. The consortium will take place in MoMA's Celeste Bartos Theater, in the Lewis B. and Dorothy Cullman Education and Research Building, 4 West 54 Street, New York.

2. "A Tensioning Device for the Reduction of Severe Planar Distortions in Paintings," by Carolyn Tomkiewicz, published in the WAAC Newsletter Volume 35, Number 2 of May 2013

Preparing for the Worst: Re-developing and tailoring a rapid response bag and procedure to the specific needs and limitations of the National Gallery

Morwenna Blewett, Paintings Conservator, National Gallery; Lynne Harrison, Paintings Conservator, National Gallery; David Peggie, Organic Analyst, National Gallery

Archival records show that most incidents of vandalism at the National Gallery have involved mechanical damage meted out with, or without, tools. Since 1863 to date, these occasions have involved 15 works of art and have included the use of knives, a hammer, a meat cleaver, razor, fist, and gun. Since 1863, there have been 4 incidents involving the imparting of a non-corrosive substance on 5 works and no instances involving corrosive agents. In total,19 works have been damaged in 20 incidents with one work undergoing more than one attack. A review of our disaster/vandalism kit and response procedure was prompted by the malicious damage sustained by two paintings in 2011. In rethinking the National Gallery's grab bag, it was determined that although some types of attack are more time sensitive than others, having a kit which contained materials and equipment to address all three types, as discussed above, would be advantageous. The earlier kit was not designed to address mechanical damage, or those featuring non-corrosive substances. The rationale behind this was based on the recognition that chemical attacks represent a grave and ongoing threat to the object, while other damage could be dealt with in the studio, or at a less urgent pace in situ. However, the experience of the attack of 2011 highlighted the advantage of having a bag containing a range of solvents, swabs and absorbent cloths to speed up the removal of non-corrosive materials from the surface of a painting. The bag was used effectively in two further real-life incidents in 2012 and 2013. Rather than providing information about a 'one size fits all' approach to the provision of emergency supplies and the adoption of a specific procedure, this paper aims to inform other institutions about the steps required to first develop an appropriate response to damage to specific cultural material. The paper also outlines and emphasises the importance of maintaining the physical upkeep of equipment and the sustained working knowledge of a procedure amongst a range of respondent staff members. It is key to identify and take account of a broad range of various issues which are unique to some institutions and common to others, as they will be contingent on creating an effective response which can be relied upon over time.

A Disaster in the Making: Preserving Southeast Asian paintings at the Walters Art Museum

Meaghan K. Monaghan, Andrew W. Mellon Fellow of Paintings Conservation, The Walters Art Museum; Karen French, Senior Conservator of Paintings, The Walters Art Museum

This presentation discusses how the Walters Art Museum is addressing the preservation of their large collection of Southeast Asian paintings. Preserving Southeast Asian paintings on cloth presents challenges that call for solutions bridging various fields of conservation. Inherent vice and unwieldy formats stretch the boundaries of painting conservation, confronting the conservator with multifaceted, and often unexpected, issues. Composed of water-soluble, lightly bound, gum-based paints, these works are extremely fragile and few survive from before the 19th century. The Walters is well known for its Western painting collection but it also has one of the largest collections of Southeast Asian paintings in America, ranging from wooden panels to long cloth banners. Prior to entering the collection, the paintings had deteriorated due to ceremonial use and less than ideal handling and storage: hot and humid environments, exposure to pests, and repeated rolling. Unrolling the fragile cloth supports for assessment revealed many pressing condition issues: large areas of flaking paint, losses, stains, creases, and tears. Additionally, some exhibit mold and a problematic green pigment that has eaten away the cloth below, creating structural losses. Compounding these problems is the matte nature of the unvarnished surface and the large scale of many works, making the appropriate choice and method of application of adhesives more complex. Due to the delicate nature of these paintings it would be ideal to store them flat, however, a third are 3 to 6 feet long and space constraints pose challenges to unframing, rehousing, long-term storage, and display.

Walters' conservators began condition surveys several years ago, but with limited space and resources, the majority of the collection has remained unexamined in storage. Without proper documentation, scholars and the public are prevented from accessing these works. In 2012 a grant allowed Walters' staff to continue surveying Southeast Asian objects donated by the Doris Duke Charitable Foundation which includes an important part of the Southeast Asian painting collection. As part of a two-year fellowship, the author is surveying the remaining Southeast Asian paintings on cloth, researching traditional materials and techniques, as well as adaptations to current storage, display, and treatment approaches. The project aims to improve the accessibility of this important and understudied part of the Walters' collection with the current resources available. Smaller paintings are surveyed and stabilized in the popular Conservation Window in an effort to inform the public about the collection and its issues. Temporarily closed gallery spaces are used to store and examine over-sized works. The survey provides information to create priority lists for long-range planning for treatment, storage, and exhibition of the collection. It also establishes a photography protocol working towards providing online images in the Walters' collections database for open access. Research trips to museums with similar painting collections in Thailand, Singapore, the United Kingdom, and the United States have helped create a network of professionals dealing with similar problems. As we move forward with the next steps in this project, this network will be an important resource for better care of Southeast Asian paintings worldwide.

The Painting Materials and Techniques of J.E.H. MacDonald: Oil Sketches from 1909-1922

Kate Helwig, Senior Conservation Scientist, Canadian Conservation Institute; Alison Douglas, Conservator, McMichael Canadian Art Collection; Dominique Duguay, Conservation Scientist, Canadian Conservation Institute; Elizabeth Moffatt, Conservation Scientist (retired), Canadian Conservation Institute

J.E.H. MacDonald (1873-1932) was a distinguished Canadian artist of the early twentieth century. He was one of the founding members of the association of painters known as The Group of Seven and is recognized particularly for his paintings of the Algoma landscape. This presentation provides results from a research project on MacDonald's painting materials and techniques. The information obtained from the project will lead to a better understanding of MacDonald's working methods and will provide valuable reference data for paintings of uncertain attribution or authenticity. The results will also inform storage and display decisions and future conservation treatments of his paintings. MacDonald's career can be divided into five major periods: Early (1908-1917), Algoma (1918-1921), Nova Scotia (1922), British Columbia and Georgian Bay (1924-1931) and Barbados (1932). A representative group of 32 works (21 oil sketches and 11 paintings) spanning his oeuvre was chosen for the project. All the works were examined under magnification and using ultraviolet illumination. Microscopic paint samples were analyzed by Fourier transform infrared spectroscopy (FTIR), x-ray diffraction (XRD), scanning electron microscopy/x-ray energy spectrometry (SEM/EDS), polarized light microscopy (PLM) and Raman spectroscopy.

The presentation will focus on 13 of MacDonald's oil sketches that range in date from 1909 to 1922. These sketches are particularly important in MacDonald's oeuvre; they document significant changes in his method, from his earliest works, where he was developing his style and painting technique, to his more characteristic sketches produced during trips to Algoma and Nova Scotia. Results presented will include a discussion of the support, the use of preparatory layers and sealing layers, the choice of pigments and pigment mixtures, and aspects of his painting technique.

MacDonald used various types of paperboard for the

majority of his sketches. The dimensions of his supports changed over the 1909-1922 period; while his early sketches are of variable dimension, he began to favour a standard board size as his technique evolved. Although he used a ground layer on a number of his early sketches, he later abandoned this practice and simply sealed his boards with shellac prior to painting. The paintings from his early period show a multi-layered, wet on wet application and a muted palette. In the later works, he employed brighter colours, confidently applied with little layering, and left the support or ground layer visible at brushstroke edges. MacDonald used a limited number of pigments including viridian, ultramarine, alizarin lake, iron oxides, cadmium yellow and vermilion. The white pigment in almost all the sketches from the 1909-1922 period is a mixture of zinc white and lead sulfate. This characteristic white paint was also widely used by other members of the Group of Seven and its source has recently been established as the Cambridge Colours paint brand. A magnesium carbonate filler (hydromagnesite) was also found in some of MacDonald's paints. Although common in Winsor & Newton oil paints, this is not a filler used in the Cambridge Colours, indicating that MacDonald employed more than one brand of paint during the period under investigation.

The History, Technical Study, and Treatment of Francis Bacon's *Painting 1946*

Ellen Davis, Conservation Fellow, The Museum of Modern Art; Michael Duffy, Conservator, The Museum of Modern Art; Chris McGlinchey, Sally and Michael Gordon Conservation Scientist, The Museum of Modern Art; Lauren Klein, Yale University

Francis Bacon's seminal work, Painting 1946, has suffered from inherent material vulnerabilities since it was made in London in early 1946. The painting's condition issues, related to the fragile, faded, and flaking pastel background, have been addressed at least three times since the painting entered MoMA's collection in 1948. Dissatisfied with the painting's material issues, Bacon proposed scraping down and repainting the background on two occasions, though the proposals were never realized. In 1971 the painting was treated at MoMA, prior to its travel to Paris for Bacon's retrospective at the Grand Palais. Though at the time, Bacon viewed the treatment as a magnificent restoration, fifteen years later the extensive areas of retouching had faded substantially. In 2015, the pastel areas were cleaned and consolidated, the faded retouching reduced and redone. The treatment methodology, the impact of the painting's history and Bacon's own artistic philosophies as they relate to that methodology, and an interpretation of the painting's compositional development as revealed by x-radiography are discussed here.

The Mellow Pad in Layers, Colors, and Time: Investigating the materials and technique of Stuart Davis

Jessica Ford, Mellon Fellow, Brooklyn Museum; Dr. Haida Liang, Professor of Physics, Nottingham Trent University; Chi Shing Cheung, Research Fellow, Nottingham Trent University

Stuart Davis took six years to complete The Mellow Pad (1946-51), an innovative and complex painting that he described as, "the most powerful objective Art realization of my life." Inherently linked to the stimulating visuals, the artist's working process and material choices affect The Mellow Pad's current condition in two significant ways. The first of these is recurring interlayer cleavage resulting from Davis's application of paint layers over a period of many years. The second is that two colors in The Mellow Pad have changed, variously fading and shifting over time.

A generous grant from Bank of America made it possible to address both of these issues in preparation for the upcoming retrospective exhibition In Full Swing: The Art of Stuart Davis, organized by the Whitney Museum of American Art. In addition to stabilization treatment and encapsulation in a microclimate enclosure, the painting will undergo a technical study of the materials using primarily non-invasive techniques. Fiber optic reflectance spectroscopy (FORS), x-ray fluorescence spectroscopy (XRF), and multiband imaging will be used synergistically to identify colorants. Additionally, X-radiography and optical coherence tomography (OCT) will further elucidate the painting's complex layer structure. With this range of non-invasive techniques, it is hoped that microscopic samples will only be required in rare situations. A similar investigation of four other Davis paintings in the Brooklyn Museum collection will give context to this research.

Considering how crucial vivid color relationships are to Davis's work of this time period, a better understanding of his materials will be beneficial to both preservation and interpretation efforts at the Brooklyn Museum and beyond.

The Autopoiesis of Acrylic Paint and Monochrome Painting in Montreal

Jessica Veevers, Doctoral Student - Art History, Concordia University

The object of art, according to anthropologist Tim Ingold, is an emergent autopoietic phenomena of an unfolding. Autopoietic form does not issue from idea, "rather [it] comes into being through the gradual unfolding of that field of forces set up through the active and sensuous engagement of practitioner and material" (Ingold, 1990:84). In short, things are not the product of artistic intentions, but instead a contingent collaboration between artistic intention and material forces. What comes first? Neither; they evolve together. Acrylic paint has a material will, a specificity and an elaborative potential that has enabled generations of

artists to create in ways that no other medium would allow. This paper will focus on one iteration of acrylic paint; that produced by the Montreal acrylic paint manufacturing company, Chromatech, owned and operated by Michael Towe between approximately 1979 and 2000, and used by Quebecois monochrome painters, to name a few: Claude Tousignant, Guy Pellerin, Yves Gaucher, Guido Molinari, and Christian Kiopini. With evidence from personal and archived interviews with the artists and paint manufacturers, Chromatech (Montreal) and Tri-Art (Kingston), this paper documents the mutual evolution between acrylic paint and monochrome painting. One would not exist without the other. Importantly, this study begins to document the influence of the small acrylic paint company, Chromatech, and the paintings that contain these paints. Currently the primary conservation issues with acrylic monochromes are handling-related (their smooth, uniform surfaces are nearly completely incapable of recovering from abrasion or cracks from bumping). But the medium is a relatively young one and as highlighted by the CAPS (Cleaning of Acrylic Painted Surfaces) workshop series through the Getty, many acrylic conservation issues are only beginning to surface. It is important that we document, when we can, which paintings contain which acrylic polymers, and additionally how artists worked so we know which additives were added. Preemptive archiving, what I have identified as this stage of documentation, is critical to emergency preparedness with regard to the conservation of modern and contemporary art. Furthermore, this study highlights the importance of integrative art historical and art conservation research. The acrylic paint medium allowed certain practices to exist; meanwhile certain cultural and art-making theories compelled a desire for the new medium and thus monochrome and colour-field painting. These painting practices were equally dominant in United States and Canada, but they were expressed and developed somewhat differently. Was it only the art-making cultures that led to the different expressions, or were there particular material-cultural interactions that led to similar, but visually and materially unique national styles?

Bocour Paints and Barnett Newman Paintings: Context and correlations

Corina E. Rogge, Andrew W. Mellon Research Scientist, Museum of Fine Arts Houston; Bradford A. Epley, Chief Conservator, The Menil Collection

The productive artistic career of Barnett Newman (1905-1970) peaked during the time when new acrylic paints were first introduced to the market. Magna, a solvent-soluble acrylic advertised as "the first new painting medium in 500 years" was introduced by Leonard Bocour in 1947 and was followed by Aqua-tec acrylic emulsion paint in 1963-64. Although Newman was reportedly careful about his materials, choosing to use artist-grade paints that he presumed more stable than the commercial house paints favored by his abstract expressionist contemporaries such as Jackson Pollock and Franz Kline, his personal relationship with Bocour led him to adopt these new media relatively early on: he used Magna in 1949 on Abraham and acrylic emulsion in 1964 on White Fire III and the Ninth Station in The Stations of The Cross: Lema Sabachthani series. Upon Newman's death in 1970, a wide range of Bocour paints were found in the artist's studio: Aqua-tec, Magna, Hand Ground Oils, Artists' Oils and Bellini Oils (a student-grade series). A selection of these materials were gifted by Newman's widow to Robert Murray, a sculptor and colleague of Newman's, who donated them to the Menil Collection in 2015. Analysis of these paints, additional paints from the artist's studio gifted by his widow to the Center for the Technical Study of Modern Art at Harvard Art Museums, and of historic Bocour paints held by the Art Materials Research and Study Center at the National Gallery, was performed in order to provide comparison with the paints present on Newman paintings held at the Menil Collection and the works loaned by other institutions for Barnett Newman: The Late Work, an exhibition held in the spring of 2015. Surprisingly, XRF analysis of the paints on the paintings shows that, in the vast majority of cases, these do not correspond to the historical Bocour paints available for analysis. However, there are strong similarities in the elemental compositions of paints used on different paintings. For instance, the white paints on Now II (1967) and White Fire IV (1967) appear to be the same, while those on Unfinished Painting [The Sail 1970] (1970), Unfinished Painting [Red & White 1970] (1970), The Way II (1969) and Midnight Blue (1970) are clearly different from the earlier group and fall into a distinct class of their own. Such correspondences could arise from different batches of either Bocour or artist-derived custom made paints. However if Newman had been mixing his own paints, he must have either made large enough batches to use on multiple works, or followed recipes consistently enough to duplicate the elemental ratios so as to be indistinguishable by the technique used here. Finally, the analysis of the historic paints also reveals some discrepancies between the listed and actual pigment composition of certain Bocour products, namely supplementing more expensive colorants with synthetic organic pigments.

An Investigation into the Materials and Techniques in Francis Picabia's *La Terre est Ronde*, 1951

Emily Prehoda, Associate Paintings Conservator, Kuniej Berry Associates, LLC; Joseph R. Swider, Senior Research Scientist, McCrone Associates, Inc

Francis Picabia is known to have commonly re-worked or completely painted over earlier versions of his paintings; however, the original image that lies beneath the surface often remains a mystery. The artist's re-painting affects not only the visible image, but also the painting's physical characteristics and changes in condition over time. Intentional visible alterations to the painted

composition of 'La Terre est Ronde' (1951, private collection), possibly the last painting completed by Picabia, were explored using detailed examination techniques combined with scientific analysis and research. The painting depicts an abstracted, white, cylindrical form resting on a white and light blue rounded Earth, contrasted against a dark blue background, with two large bright green circles above, and smaller white circles surrounding the columnar form. Pentimenti was indicated by vertical brushstrokes extending upwards and downwards from the white form, which did not correspond to the visible paint application. These were compared against a previously known possible source image of 'the Angel from the Seventh Seal of the Apocalypse,' an illumination from the Beatus d'Urgell manuscript (Catalan artist, 10th C.). Technical examination and X-radiography images taken using a digital X-ray detector confirmed that Picabia omitted anatomical aspects of the source figure as he originally painted it. He reworked his composition to create a fully abstracted form, covering the angel's head and censer with bright green circles, and painting out its arms, legs, and feet.

Furthermore, unexpected physical characteristics, condition issues, and unintentional alterations in the painting's appearance over time were encountered during examination and testing, which impacted the course of conservation treatment. Picabia experimented with various paint media throughout his career, which may have contributed to unique condition concerns. An extensive network of open cracks in the green painted circles, and the presence of small, white, crystalline efflorescences in the blue background merited scientific analysis and research to better understand their physical components, and assist in devising an ethical and effective treatment strategy. In-depth scholarly research and technical examination included infrared reflectography, ultraviolet photography, and photomicrography. Samples of pigments, crystalline efflorescences, and two varnishes were analyzed using scanning electron microscopy with energy-dispersive X-ray spectrometry (SEM/EDS), micro X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and light microscopy (LM). Pigments present in the green paint were found to be rather unusual, and may merit further investigation and comparison against pigments identified in Picabia's other late paintings. This paper will discuss Francis Picabia's materials and techniques used in 'La Terre est Ronde,' and how they have contributed to unexpected condition issues, requiring thoughtful preparation, research, and treatment to stabilize and best preserve this unique Dada painting.

The Life of Modern Painted Walls: Ethics, emergencies, and the future

Rustin Levenson, President and Founder, ArtCareMiami and ArtCareNYC; Oliver Watkiss, Senior Conservator, ArtCareMiami; Veronica Romero Gianoli, Senior Conservator, ArtCareMiami

Ethics: For decades, graffiti has been accepted as a form of artistic expression by reviewers, museums, and in the marketplace. The graffiti community has very specific ethics about art that appears in public. The response of the conservation community to graffiti must take into consideration how this code affects the life of a street work. Our efforts to preserve and treat graffiti "pieces," "tags," "throw-ups," "wildstyles," or "blockbusters" must include sensitivity not only to the materials, but also to the culture and politics of graffiti art. Emergencies: What happens when a wall comes down? Case studies of treatments of graffiti works and painted walls at the Wynwood walls, the Miami Marine Stadium, New York's East Village, and public and private collections including material and community solutions. The Future: As outdoor murals and the walls they are painted on degrade, re-creations of the works are planned. This part of the session will focus on conservation involvement with these projects and will set forward standards for the ethical re-creation of public works.

Reconciling the Past through the Conservation of the Fresco Mural Painting *Haitian Massacre, 1937*, by Dominican artists José Ramírez Conde and Roberto Flores

Hilda Abreu Utermolhen, Executive Director, HILAB; Viviana Dominguez, Principal and Chief Conservator, Art Conservators Lab LLC

The mural "Haitian Massacre, 1937" that will be revealed to the public at the Memorial Museum of the Dominican Resistance (MMRD) depicts a scene from the brutal event that took place between the bordering nations of Haiti and the Dominican Republic during Rafael L. Trujillo's regime (1930 -1961). This mural conservation project of compelling historical significance brings together the conservation of a rare depiction of the sad history of the massacre, the introduction of an emergency disaster recovery project, the public awareness of the horrors committed during the regime, as well as the preservation of one of the few fresco murals of the country. Renowned Dominican artists José Ramírez Conde and Roberto Flores painted the fresco in a concrete wall in a private home in the suburbs of Santo Domingo, Dominican Republic. The mural is a tribute to the Haitian men, women and children, living in the northwestern Dominican borderlands, hunted and killed by Trujillo's soldiers in 1937. As this house was being demolished in 2014, neighbor Cristian Martínez Villanueva saved the fresco from demolition on behalf of the MMRD by directing a rescue operation in which the wall was cut away from the house, braced with steel beams, and transported to Mr. Martínez's home driveway, where it now sits covered with a plastic tarp, awaiting to be moved to the Museum. The artwork is in poor condition, due to damage suffered during this operation, evident in the losses and delamination of the fresco mortar. Thanks to an award by The U.S. Ambassadors Fund for Cultural Preservation a project is underway to preserve it. Hilda Abreu Utermohlen, Paintings Conservator from the Dominican Republic, is the project

conservator, and Viviana Dominguez, Mural Conservator from the U.S. is the leading conservator of this project. Mrs. Utermohlen brings 27 years of experience on the conservation of painting and has deep knowledge on the Dominican Republic art history. Ms. Dominguez has 28 years of experience on the conservation of mural paintings and good understanding of Haitian culture. In the spirit of fruitful bilateral collaboration and understanding between the Dominican Republic and Haiti the conservators have put together a team of experts from the both nations, to work on the treatment of the mural, including Joe Junior Racine, from Haiti, who was trained by Ms. Dominguez on the rescue of mural paintings from a cathedral damaged in the 2010 devastating earthquake in Port-au-Prince, as part of the Smithsonian Institution Cultural Recovery Program. A team of architects and engineers is working on the transportation and installation of the mural. The authors will describe the conservation plan of this important cultural asset, the treatment protocol, the transportation of the wall to the new location and its complex installation at the museum in downtown Santo Domingo. It is hoped that the conserved mural will be a powerful interpretive tool to reflect on human rights and to foster the advancement of relations between Dominican Republic and Haiti.

The Resurrection of The Angel

Laurence Gagné, Owner, Art Conservator, DL HERITAGE INC.; Emily Ricketts, Conservator, Conservation of Sculptures, Monuments and Objects; Alexander Gabov, Conservator/owner, Conservation of Sculptures, Monuments and Objects

Conservation science is a powerful tool that can change and even sometimes reverse the way we experience a historical artwork. This was the case with a painted high-relief at St. Mark's Anglican Church in Barriefield, Ontario--a piece better known to its congregation as "The Angel." Recent conservation efforts guided by research, rigorous methodology, and a strong sense of ethics have brought to light important and unexpected aspects of this artwork. These discoveries ultimately led to the successful conservation and revelation of The Angel's glorious past.

The Angel mysteriously appeared on the north chancel wall of St. Mark's sometime after 1897. This unique high-relief occupies the north chancel wall at the front of the church and is distinguished by its large-scale format- measuring 5 meters high by 4 meters wide. Its manufacturing technique consists of painted cast plaster and its singular iconography represents an angel and three cherubs. Though the relief bears no artist signatures or marks, literary evidence indicates that the piece was restored in 1951 by a famous Canadian painter, André Biéler (1896-1989). Biéler was an art professor at Queen's University from 1936-1964 and was also the founding director of the Agnes Etherington Art Centre (1957).

The artwork was analyzed with polarized light microscopy (PLM), Fourier-transform infrared spectroscopy using attenuated total reflectance (ATR-FTIR), and infrared and ultraviolet photography. Analysis confirmed the nature of the substrate, identified the binder used in the paint sub-layers, and most importantly, revealed the complete paint stratigraphy, which clearly indicated three distinct painting campaigns. Further solubility tests for overpaint removal confirmed the analytical results and revealed unexpected details.

Based on the analytical results, it was concluded that what was thought to have been painted by André Biéler had in fact been completely overpainted by the third and last restoration campaign. Before treatment, this outermost paint layer, which was very roughly executed, was all that was visible to the church and community members. In collaboration with Mr. Patterson, Father Haynes, Mr. Du Prey, and many parishioners of St. Mark's Church, the conservation treatment successfully brought the artwork back to the second painting campaign, which is much closer to the original artistic intent.

A Study of Painted Animation Cels, Their Materials and Deterioration Processes

Katharina Hoeyng, Research Associate, Getty Conservation Institute; Suzanna Etyemez, Research Associate, Dresden Academy of Fine Arts; Joy Mazurek, Assistant Scientist, The Getty Conservation Institute; Kristen McCormick, Art Exhibitions and Conservation Manager, Walt Disney Animation Research Library; Alan Phenix, Scientist

Until the advent of computer-generated imagery towards the end of the twentieth century, traditional hand-painted cel animation was the usual method for creation of animated movies. The illusion of movement was created by sequential photographing onto motion picture film of inked and painted images – usually on transparent cellulose nitrate or acetate sheets - that differed incrementally; on average 24 separate shots provided one second of film.

Surviving animation cels today present challenging conservation problems for conservators and archivists. The Walt Disney Animation Research Library (ARL) in California houses perhaps the world's largest repository of animation cels. In 2015 the Disney ARL began a collaborative research project with the Getty Conservation Institute (GCI) that aims to improve understanding and knowledge of animation cels, and to develop new approaches for their preventive and remedial conservation. A multidisciplinary team faces the challenge of preserving a collection of functional paintings that were originally expected to last only for the duration of the film production and never meant to be archived. Having served their initial purpose, many animation cels were discarded right after production, others were sold in limited quantities, and others were saved in the Disney art morgue. Today, there are roughly 500,000 animation cels archived at the ARL, which equals about 6 hours of animated movie.

The surviving cels are no longer simple functional items created solely for the purpose of making a movie: they are seen as works of art in their own right. They serve as historical as well as technological and cultural documents of their time.

Accordingly, animation cels have value in their own right as cultural heritage material; archivists and conservators are faced with the questions of preservation, conservation and access. As a first step in this collaborative endeavor an in-depth condition survey of animation cels at the ARL has been conducted. This survey provided a unique opportunity to examine the sheets and paints used in the Walt Disney Animation Studios over the course of a 60 year period, and to observe, track, and understand deterioration processes in detail. In parallel with the condition survey, the material composition of the sheets and paints has been studied, using both archival documents and instrumental analytical methods such as FT-IR spectroscopy and Gas Chromatography/Mass Spectrometry (GCMS). Until the late 1980s the Walt Disney Studios made their own paint based on a general recipe that was modified continuously. Studying the materiality of the painted cels and their changes over time provides the essential basis for evaluating conservation treatment possibilities.

This paper, focusing on the paint, will present broad perspectives as well as detailed findings emerging from the condition survey as well as the material studies. Consideration will be given to the implications of these findings for preventive and remedial conservation.

Using Web-Based Projects to Promote Conservation and Engage Diverse Audiences

Brian Baade, Assistant Professor, Painting Conservator, and Researcher of Historical Painting Materials and Techniques, University of Delaware; Kristin DeGhetaldi, Paintings Conservator, PhD Program in Preservation Studies, University of Delaware

In 2014, FAIC launched a research survey "Charting the Digital Landscape of the Conservation Profession." Initial findings showed that the conservation field would benefit from new and engaging methods to connect with the general public and allied professionals (e.g. art history, the sciences, etc.). This presentation will outline two web-based projects that focus on traditional easel paintings; these projects implement digital media and web technology to appeal to non-traditional audiences. Work on the "Kress Technical Art History Website," a site hosted by the University of Delaware, began in 2013. The aim of the site is to educate a wide audience, specifically educators functioning in a museum or university setting, as well as members of the general public who have an interest in the materials, techniques, and technical investigation of traditional Western Easel Painting. The Kress Technical Art History site explores these aspects through guided slideshows, engaging the viewer through a step-by-step process for eighteen Old Master Paintings, outlining each stage of the creative painting process. Complementary information relating to historical art materials and analytical processes are also outlined. A second interactive website hosted by Villanova University will also be discussed. This site outlines the many stages of a two-year conservation project using a month-by-month timeline and geo-mapping software. Viewers are invited to virtually experience each step of the treatment of a 12 x 20' 17th-century Italian oil on canvas painting entitled The Triumph of David, including the initial examination of the painting, consolidation and cleaning, and finally filling and retouching losses. Additional sections of the website feature information relating to provenance and the art-historical background of the painting as well as the scientific examination and imaging that was carried out by the conservation team. A major goal of the site is to "de-mystify" the process of a complex and involved treatment process while emphasizing the specialized expertise required of conservators and technical art historians. The Triumph of David site provides users with accessible documentation that can be used by the art community to inform future research relating to the artwork. Both speakers will address practical aspects of these websites, including unforeseen challenges, user feedback, and suggestions for those planning future web-based projects relating to the field of conservation.

Carlo Crivelli's *St. George Slaying the Dragon* at the Isabella Stewart Gardner Museum: Technique and Restoration

Gianfranco Pocobene, John L. and Susan K. Chief Conservator, Isabella Stewart Gardner Museum; Jessica Chloros, Associate Objects Conservator, Isabella Stewart Gardner Museum; Richard Newman, Head of Scientific Research, Museum of Fine Arts, Boston

Crivelli's "St. George Slaying the Dragon," one of six panel paintings that originally formed the Porto San Giorgio Altarpiece of 1470, underwent a comprehensive technical examination, cleaning and restoration in preparation for its inclusion in the first ever monographic exhibition dedicated to the artist in the United States. Ornament and Illusion: Carlo Crivelli of Venice, at the Isabella Stewart Gardner Museum (October 22, 2015 – January 25, 2016) explores multiple aspects of a significant Italian Renaissance artist whose work has been largely overlooked. Executed with astonishing skill in a variety of media, including egg tempera, metal leaf and ornamental relief, St. George Slaying the Dragon exemplifies the artist's idiosyncratic manner characterized by dramatic compositions, remarkable illusionistic effects and lavish decoration. The technical study revealed fascinating aspects of Crivelli's meticulous facture which was revealed through imaging and analytical techniques including infrared reflectography, reflectance transformation imaging, x-radiography, x-ray fluorescence analysis, cross-sectional analysis, and scanning electron microscopy. Most notable among the technical findings was the artist's use of extensive underdrawing, the elaborate and skillful use of "pastiglia" relief elements and the confirmation that in addition to conventional gold ground techniques, silver leaf, now badly tarnished was originally used as a prominent form of ornamentation in the picture. The 2015 cleaning and restoration of the picture addressed aesthetic issues concerning the removal of an eighty year old PVA varnish and yellowed wax

coatings, old restorations that no longer matched the original surfaces and reintegration of losses and abrasions. Last conserved in the mid 1930's, portions of the picture had been left minimally restored in significant areas, an approach often taken by American paintings conservators during the mid-20th century. More problematic for the present treatment was the documented condition of the picture before the 1934–35 conservation. A comparison of archival photographs revealed that in-painting carried out in 1934-35 was not executed to the same level of finish as was undertaken prior to Isabella Gardner's purchase of the painting in 1897. Given the elaborate and highly refined techniques Crivelli employed, the present treatment sought to carry out the restoration to high degree of finish all the while respecting the age of the picture. To that end, the reintegration of egg tempera paint losses aimed to imitate the fine and elaborate technique used by the artist. As the restoration progressed, it became evident that losses in the gold leaf surfaces, especially in the "pastiglia" reliefs greatly compromised the artist's intended visual effects. To bring greater balance to the appearance of the image, selected areas were resurfaced using combinations of 23K gold leaf and shell gold toned to match the aged look of the original gold surfaces.

Exploring Pieter de Hooch's Mid-Career Period: A Study of Growth in Creativity

Dina Anchin, Associate Painting Conservator, National Gallery of Art

In the course of Pieter de Hooch's artistic career, both his style and technique of painting evolved, shifting in response to his contemporaries as well as to the current interests of the art market. As De Hooch comes into his artistic maturity in the mid-late 1650s, entering what is considered his most artistically creative period, his paintings become more refined in technique, sensitive in palette and composition, and innovative in subject matter. In the late 1650s, De Hooch begins creating carefully composed domestic scenes of mothers and housewives with deliberate attention paid to naturalism, light sources, and quality of light. As the mid-career period progresses, his subject matter shifts to the depiction of more prosperous households and elegant genre scenes. Despite this change in subject, there is still sensitivity to spatial order, naturalism, and perspective throughout all the mid-career compositions. The technical quality of these paintings remain strong, which differs from the earlier works, which are mainly low-life genre compositions painted in a sketchy manner with a dark, earth-toned palette, and also from works of his later period, when De Hooch begins to produce more paintings, at the expense of their quality in reaction to the economic decline of Amsterdam in 1672. This study investigates De Hooch's painting methods, specifically his technique, painting practice, and material choices, during his mid-career period. The three paintings by De Hooch in the National Gallery's collection, A Dutch Courtyard, The Bedroom, and Woman and Child in a Courtyard, all dating to 1658-1660, are a main focus of the study, though examination of a number of De Hooch's paintings in other institutions played a integral role, further adding to the knowledge base of the artist's painting technique and materials choices. In addition, while these mid-career paintings are the focus of the study, some artworks from his early and late career were examined in order to put findings in context and to better understand how de Hooch's technical practice evolved over the course of his career. Last, treatment and technical analysis of one of the National Gallery's paintings, Woman and Child in a Courtyard, complemented the study and overall findings.

Experimental Study on Merits of Virtual Cleaning of Paintings with Aged Varnish

Giorgio Trumpy, Research Fellow in Imaging Science, Scientific Research Department - National Gallery of Art; John K. Delaney, Senior Imaging Scientist, Scientific Research Department - National Gallery of Art

Aged and discolored varnishes on paintings are known to decrease the brightness of the white, brighten the darks and give an overall color shift towards yellow. These alterations often cause a loss of three-dimensional appearance. Digital 'virtual cleaning' utilizes color images and ad hoc information about the optical properties of the varnish and the painting surface to provide conservators and curators an intuitive feel of how the appearance of the painting will change if the varnish is removed/replaced. Virtual cleaning with more spectral information (e.g. multispectral data) on mock-ups paints glazed with an artificially aged varnish or comparing the reflectances of degraded parts of the painting and parts that did not degrade since they were protected (e.g. by the frame) have been attempted to generate more realistic appearance of cleaned paintings. In the present paper we will report on further studies to develop a more complete and accurate model that describes how the aged varnish alters the color appearance of a painting. This is done through hyperspectral imaging of paintings undergoing conservation treatment, following the change in reflectance with the varnish removal process and developing a mathematical model that describes the change. We will report on two panel paintings that were followed during their conservation treatment: the first painting is a small impressionist panel by Georges Seurat entitled "Haymakers at Montfermeil" c. 1882, and the second is a Dutch still life by Jan van Huysum entitled "Flowers in an Urn" c. 1721, both paintings with a large range of colors, exhibiting vibrant pure colors as well as dark passages. The experimental method adopted is to measure the diffuse reflectance spectra before and after the removal of the aged varnishes on the paintings, as well as after application of a fresh varnish. The removed varnish that has been absorbed in cotton swabs is solubilized and the transmission is also measured. This allowed us to define a mathematical model for the varnish/painting system that describes the optical phenomena associated with aged varnishes, adapting a formula derived from the Kubelka-Munk theory to include the effects of the interface modification with the exposure of the rough air/paint interface, and including the contribution of grime. The

comparison between the colorimetric values of the painting after real cleaning and after the virtual cleaning with our varnish/painting model shows that satisfactory results can be achieved with few point-based diffuse reflectance measurements before and after actual varnish removal. However, residual discrepancies are ascribable to spatial variations in the characteristics of the varnish (optical density, thickness) and of the exposed painting (roughness).

The Identification of Natural Indian Yellow and Other Historic Late 19th Century Pigments from the Toulouse-Lautrec Estate in France

Aaron N. Shugar, Andrew W. Mellon Associate Professor of Conservation Science, Buffalo State, SUNY; Rebecca Ploeger, Assistant Professor of Conservation Science, Buffalo State, SUNY

Historic paint samples were sampled from Château du Bosc, the family home of Henri de Toulouse-Lautrec. The home is located in Aveyron, France, approximately one hour from Albi, Toulouse-Lautrec's birthplace. Due to his death at a young age, the Château was passed down to Toulouse-Latrec's cousin, and remains the home of a distant relative. The samples retrieved were collected from tin based tubes housed in wooden shipping boxes. In most cases, the tube labels are legible, and the paint distributors' names have been linked to contemporary artists of the time, such as Vincent van Gogh and Gustav Caillebotte. A range of scientific analyses, including PLM, XRF, μ-FTIR, py-GC-Ms and Raman Spectroscopy, were employed to fully characterize these pigments to study the paint media, fillers/extenders, pigments, and some degradation products. The samples range in colour from reds, greens, brown, blues and yellows. Some of the interesting results will be featured here, including the discovery and characterization of natural Indian Yellow.

Facts and Fictions of Pink Prints

Jennifer McGlinchey Sexton, Conservator, Paul Messier LLC; Paul Messier, Head of Lens Media Lab, IPCH, Yale University

Distinctive pink discoloration of image silver is an increasingly common form of deterioration of silver gelatin prints made from circa 1960 to circa 1980. More than 50 cases have been brought to the attention of Paul Messier LLC conservators since 2003. Seemingly linked to the oxidation of image silver, pink staining is often accompanied by bleaching of highlights. This staining can be drastic and sudden, posing significant challenges for collections and conservators.

Why do these prints turn pink, instead of the more typical signs of deterioration like silver mirroring, yellowing and fading? The root causes are unknown, but most agree that typical environmental catalysts (exposure to light, water vapor, and pollutants) are a factor. Further speculation centers on additional factors that may impact the stability of these prints including processing variables and changing manufacturing practices.

The effective and complete clearing of hypo (sodium thiosulfate based fixer) dominates much of the 19th and 20th century literature on print permanence, but concerns about over washing are fairly new. Review of manufacturer recommended washing recommendations, particularly the use of hypo eliminators and washing aids, shows a circumstantial relationship between "aggressive" washing recommendations and the time period associated with pink prints. This review has specific emphasis on recommendations provided directly to photographers, not texts related to preservation or analysis of photographs.

These decades are also notable for historically high silver prices and environmental protection imperatives. Using X-ray fluorescence spectroscopy, a survey of historic samples of photographic papers made from 1950 to 1990 is being conducted to determine if silver and heavy metal content vary during this period. This work involves unfixed and fixed samples in order to determine inorganic materials present before and after processing.

Combined, historical context and data on inorganic content will provide steps toward understanding the facts and fictions of pink prints. This work will provide a platform for future research, including possible screening for undamaged but vulnerable prints, environmental recommendations, and treatment protocols.

Understanding Temperature and Moisture Equilibration: A Path towards Sustainable Strategies for Museum, Library and Archives Collections

Jean-Louis Bigourdan, Senior Research Scientist, Image Permanence Institute, Rochester Institute of Technology

Since 2010, the Image Permanence Institute (IPI), a department of the College of Imaging Arts and Sciences at Rochester Institute of Technology in Rochester, NY received funding from the U. S. National Endowment for Humanities for two consecutive three-year research projects, to investigate new methodologies for sustainable management of collection environments. Collections of enduring research value and cultural significance reside mainly in libraries, archives and museums that are under pressure to reduce their use of energy. While it is widely recognized that providing a proper environment is the most important element for preservation, HVAC operations are under scrutiny. In response, institutions are considering a variety of strategies to minimize energy use, such as moving from a static environmental management approach, where macro-environmental temperature and humidity settings remain stable and constant, to a dynamic approach involving methodical nightly, weekend, or seasonal settings adjustments. IPI's current research addresses the lack of systematic study of what happens to collection materials when short-term climate changes occur; it is also testing the efficiency of new environmental profiles that might combine potential energy savings with efficient humidity control. Looking to common material-enclosure configurations, such as books on shelves, prints and photographs in boxes, maps in flat-file cabinets, IPI's research explores several key questions: How do temperature and humidity changes propagate through objects and collections? How do seasonal changes affect collections? How can collection managers assess the risks or benefits of dynamic environmental changes that occur in a repetitive pattern over long periods of time? Which sustainable HVAC management approach has the greater potential for the future? The thrust of this presentation is to report new findings regarding thermal and moisture transfer between materials and collection environments. These results will be based upon extensive laboratory testing and field experimentation. IPI's research will provide new and significant insights into the dynamic relationship existing between the changing conditions of the macro-environment, the micro-environment surrounding a collection object, and the object's core. Most notably, it will underscore the role of collections in controlling their own macro-environment. It is believed that the gained knowledge will enable and support profound changes in the way HVAC operations are managed.

Photochromatic Images of Edmond Becquerel: Where do the colours come from? Tracks in the understanding of the origin of their colours

Dr. Marie-Angélique Languille, Conservation Scientist, Centre de Recherche sur la Conservation/CNRS; Saskia Vanpeene, Conservation Scientist, Centre de Recherche sur la Conservation/CNRS; Edouard de Saint-Ours, Student, Centre de Recherche sur la Conservation/CNRS; Jean-Marc Frigerio, Professor, Institut des Nanosciences de Paris / UPMC; Chirstine Andraud, Professor, Centre de Recherche sur la Conservation/MNHN

Edmond Becquerel (French physicist, 1820-1891) introduced

in 1848 the first colour photographs called by himself, "photochromatic images". Among the first images was the recording of the solar spectrum he produced by directly projecting it onto a sensitized silver plate [1, 2]. At least, two examples of this solar spectrum image are kept in museum collections, one at the Musée Nicéphore Niépce (Châlon-sur-Sâone, France) and the other one at Musée des arts et métiers (CNAM, Paris). However photochromatic images are still light sensitive and have to be kept in the dark [3]. Becquerel wrote he had not yet "been able to arrest the subsequent action of diffused light which gradually destroys the images" [4]. Despite many attempts, Becquerel and other followers such as Abel Niépce de Saint Victor (1805-1870) who revisited Becquerel's process in the 1850s and the 1860s, never managed to make them light stable. The long exposure times required to produce the image and its light instability prevented the diffusion of the process among the public at large. A small number of photochromatic images have survived till today. The recent rediscovery of a batch of these early colour photographs in the archives of the National museum of natural history in Paris has brought a new interest for this process in particular to better understand the origin of the colours. Interestingly, if many hypotheses have been stated, the origin of colours has never been clearly demonstrated, and even scientifically re-explored since the 19th century, except a first study in 1999 [5]. A preliminary study funded by "Sorbonne Universités" and gathering different laboratories is endeavouring to reexamine those intriguing images. Our paper will describe this initiative, from the production of photochromatic images following Becquerel's publications to its analysis. The direct printing-out positive colour images are prepared in a very simple way that requires no development: a polished silver plate is sensitized by a chlorine solution and then exposed to the light in the camera. We studied parameters described by Becquerel to play a role in the formation of the images: the preparation of the silver plate, the thickness of the sensitized layer, the visible spectral bandwidths of the exposure, etc. We examined the relationship between the image microstructure and its optical properties. The microstructure of the coloured plates, the sensitized layer thickness, its morphology, and its porosity, as many characteristics that control the colours were investigated by using electron microscopies. Our multi-scale approach, from the naked- eye view to a sub-microscopic scale, will help us to relate the macro and micro-images to the reflectance properties measured with UV-Visible reflectance spectroscopy. This leads to a better understanding of the origins of the colours.

[1] E. Becquerel. Annales de Chimie et de Physique, 22:451–459, 1848.

[2] http://www.museeniepce.com/index.php/collections/enjeux-de-la-photographie/L-utopie-photographique. [Online; accessed21-Aug.-2015]

[3] B. Lavédrine and J.-P. Gandolfo. L'autochrome Lumière. Secrets d'atelier et défis industriels. Paris : CTHS, 2009.

[4] E. Becquerel. Photographic and Fine Art Journal, 8:8, 1855.

[5] M. Kereun, Mythes et réalités autour de la fixation des couleurs héliochromiques. Mémoire de DEA, CNAM, 1999.

Separation Anxieties: Approaches to Freeing Photographs That Are Stuck to Glazing or to Each Other

Barbara Lemmen, Senior Photograph Conservator, Conservation Center for Art and Historic Artifacts; Emme Lowe, Conservator, University of Lincoln

Since high-humidity environments and aqueous solutions will swell gelatin emulsions and increase their solubility and tack, silver gelatin black-and-white and color photographs are often brought to photograph conservators for treatment following small- and large-scale water disasters. Collections of photographic prints and negatives may become firmly adhered to one another in a stack, preventing access to their content, or locally stuck to the glazing in their frames. Severe distortion, staining, and mold growth, which often occur simultaneously with adhesion, complicate the condition issues and treatment protocols for such photographs. Photograph conservators have developed treatment approaches that are generally successful for certain types of damage. Such protocols include the introduction of moisture locally or overall through water vapor, poultices, or liquid water; altering the temperature, pH, and/or polarity of the water; and mechanical manipulation and heat, alone or in combination with the preceding approaches. These techniques require the conservator to have a basic understanding of the chemical and physical characteristics of gelatin and of its photographic support, both in their original and newly compromised conditions. Until recently, the nature of the bonds formed between gelatin and glass had not been explored and were poorly understood. This presentation will introduce new investigations into the mechanics, chemistry, and aging of gelatin-to-glass bonds. It seeks to spur new approaches to the treatment of water-damaged photographs, as well as to expand the treatment repertoire for photograph conservators facing such challenges.

When Inkjet Prints Get Wet: First Contact to Weeklong Submersions

Daniel Burge, Senior Research Scientist, Image Permanence Institute, Rochester Institute of Technology

Responders to water emergencies in museums, libraries, and other cultural heritage institutions would benefit from advanced knowledge of their collection's condition when they finally gain access to the flooded environment. This project was intended to provide just such data for modern inkjet prints. It is possible that some inkjet print types may be so severely damaged that recovery efforts should be directed towards other, potentially salvageable materials. Conversely, objects that can withstand extended periods immersed should be known so that recovery efforts can be focused on print types which have a narrower window of recovery. These results should help staff prioritize salvage which is one of the most critical components of response.

In the project's experimental program, a variety of inkjet print types prints were immersed in clean tap water for time increments of 1 second, 10 minutes, 1 hour, 8 hours, 24 hours, 48 hours, and 7 days. This was done to provide an extended range timeline for print behavior in water. Multiple measures of print appearance were monitored for change with increasing time in water. These included ink bleed, paper yellowing, optical brightening agent loss, gloss change, surface cracking, and planar distortion.

It was found that a large number of inkjet prints suffered extreme damage directly on contact with water, leaving no time for successful recovery. Those most affected were dye inkjet on polymer and uncoated fine art papers. Some dye inkjet on porous-coated papers, however, were able to withstand immersion for hours or several days. In general, pigment prints were more resistant to water than dye with some lasting the entire week with only planar distortion. Still, some pigment inks bled which was unexpected and should be considered when preparing a disaster response plan. Most inkjet printing papers can be used for either dye or pigment inks and behave independent of the colorant used to make the print. The papers in the simulated water emergencies suffered a multitude of damage variations including planar distortions, surface cracking, optical brightener loss, and gloss change but at different rates and to varying degrees. From the above data sets, a prioritization strategy was created to provide basic guidance on response and recovery of these materials during water emergencies.

Salvaging Memories: The Recovery of Fire-Damaged Photographs and Lessons Learned in Conservation and Kindness

Debra Hess Norris, Chair of the Art Conservation Department and Professor of Photographic Conservation, Winterthur/University of Delaware; Barbara Lemmen, Senior Photograph Conservator, Conservation Center for Art and Historic Artifacts, Winterthur/University of Delaware Program in Art Conservation Class of 2017

With the start of our two-week January 2015 Winterthur/University of Delaware Program in Art Conservation Photograph Conservation Block, first-year Fellows and many other committed students, faculty, staff, and volunteers began the intense recovery of a collection of 260 family photographs. These images were miraculously salvaged from a catastrophic fire on Christmas Day in Ohio that tragically killed a loving grandmother, Terry Harris, and her three beautiful grandchildren – all boys – 9, 11, and 14 years old.

The children's father, Ricky Harris, was a close high-school friend of our Preservation Studies doctoral student, Michael Emmons. Michael sought advice on how to salvage the recovered photographs. Given the photograph block timing, it seemed perfect to offer our assistance to clean, flatten, and rehouse the heavily-damaged images, preparing them for scanning at a later date where possible. Michael worked with us closely providing valued context.

These silver gelatin developing-out, chromogenic, and dye diffusion photographs capturing generations of the Harris family ranged in size; all suffered from fire and water damage and many were in poor condition, badly burned or melted. Accumulated layers of grime, debris, soot, and other particulates combined with flaking or blistered gelatin binder layers required careful treatment strategies, including the use of dry and wet methods such as cosmetic, PVOH, and soot sponges; erasers; and ethanol. During treatment photographs were housed with natural zeolites, blotters, and other absorbent materials to minimize odor. Photographs were distorted and blocked; humidification and flattening of resin-coated papers was challenging, especially given our 16-day time frame and the need to complete the entire photograph conservation block curriculum simultaneously. Innovations in treatment were introduced and all procedures were carefully charted on flip-chart pads to ensure consistency.

Our story was picked up by the Associated Press; coverage was global and continues. Indeed, this project offered many lessons in advocacy and public communications as our students answered questions from reporters and shared their skills with camera crews.

While clearly burned, distorted, and dirty, these photographs were preserved; the Harris's gratitude for our work was heartfelt and profound. This recovery educated, transformed, and inspired all who contributed their time, talent, and expertise. In many ways, it exemplified the skill and humanity of art conservation. As a profession, we must find ways to share our skills and knowledge broadly, to be a visible presence following unthinkable tragedy, and a known resource for families facing the potential loss of their treasured photographs.

Separation Anxiety: Kiss Your Acetate Goodbye!

Nicole Christie, Conservator, Peterborough Museum & Archives; Cindy Colford, Conservator, Peterborough Museum & Archives, and President, Canadian Association for Conservation

The Peterborough Museum & Archives' photographic collections comprise nearly half a million images spanning more than 100 years. They provide an invaluable visual history of Peterborough's people, places and events.

In 2008, an internal assessment indicated that many of the acetate negatives were in an advanced stage of deterioration as marked by the pitting, blistering and pronounced channelling that completely obscured the images. In order to preserve these irreplaceable images, techniques were developed and tested for separating the emulsion layer (image) from the acetate base. After several trials, a successful method was established and implemented.

This presentation recounts the trials and tribulations encountered while stabilizing these deteriorated acetate negatives – an

issue that many institutions must confront – and provides an update on the current state of these collections, now eight years later.

Problems with Image: A Conservator's Role in the Attribution of Photographs

Adrienne Lundgren, Senior Photograph Conservator, Library of Congress

In 2013, the author undertook a project to examine the photographic work of F. Holland Day in the collections of the Library of Congress. The F. Holland Day collection, received directly from his estate upon his death, is composed of over 700 prints and is the largest collection of his work in the world. The goal of the project was to create a model of a materials-based catalogue raisonne for a photographic artist. The primary motivation was to demonstrate the principle of consistent, methodical data collection in understanding a photographic artist's working methods.

Through the collection of this data, including paper texture documentation, paper thickness, etc., the author was able to develop a more complete picture of Day's materials and techniques allowing for a more accurate attribution of unattributed or mis-attributed prints. However, what also emerged were prints with images by Day, but whose materials were uncharacteristic. This lecture will discuss the re-assigning of print attribution using materials-based attributes as a primary source of reasoning.

Most interestingly, the author will discuss the problematic attribution of works to Day and other artists, all of whom were connected to photographer Frederick Evans. This case study brings to light the problem of attributing photographic prints based on image, and how the conservator is a key player in unraveling these mysteries.

Methods for Cleaning Brass Mats From Cased Photographs

Christophe Vischi, Conservator of Photographs, National Gallery of Canada; Ariane Lalande, Artifact Conservator, Centre de Conservation du Quèbec; John McElhone, Chief Conservator, National Gallery of Canada; Chloé Lucas, Student, Institut National du Patrimoine

8In 2009 the Centre de conservation du Québec (CCQ) received a request for restoration of a photographic assemblage from the collection of the Colby-Curtis Museum in Stanstead, Quebec. The object consisted of twelve individual photographs mounted together in a wooden frame and included both daguerreotypes and ambrotypes. The brass mats of the individual photographs showed multiple corroded spots. Before undertaking the restoration, three methods of corrosion removal were studied: the Rosenberg method of galvanic corrosion of a sacrificial anode; local electrolysis; and localized application of an ion exchange resin - in this case Amberlite IR120 H. The three approaches will be discussed briefly in terms of effectiveness, rapidity of action, and controllability of the application system. The ion exchange resin approach was selected for use on the object at the CCQ. The resin (a polymer with acidic side groups), when placed in contact with metal oxides (or chlorides, or carbonates), cause these corrosion products to be reduced. The used exchange resin can be completely removed, leaving no chemical residue. Subsequent development of the method refined the technique for application of the resin and explored the use of mica powders for inpainting the treated areas. The ion exchange resin treatment method seems to be a promising approach to the treatment of brass mats from cased photographs; it should be further tested for its potential effects on the tinted shellac coatings and to discover its long term effects, if any.

Enhanced: Nineteenth Century Hand-coloured Photographic Portraits

Anne MacKay, Head, Conservation, McCord Museum

This paper traces the evolution, in the 19th century, of the use of photography in portrait painting, linking it both to developments in technology and to historic notions about artistic practice. Conservation examination and analysis, cross-collection museum research and historical references are employed in the elucidation of the development of an important artistic technique. The Notman Photographic Archives at the McCord Museum in Montreal contain over 1,300,000 images, documenting the social history of Montreal, Quebec and Canada. About 400,000 images were taken by the Notman Photographic Studios, founded by William Notman in 1856, and run by his family until 1935. Notman was a trailblazer of new technologies, a prosperous entrepreneur and a leader in the cultural life of Montreal during the second half of the 19th century. The archives also include about 900,000 images by other Canadian photographers, dating from the 1840's to the 21st century. The Museum's collections contain over 300 known or assumed hand-coloured photographs, mostly portraits, from both William Notman's company and the studios of other Canadian photographers and artists. While the focus was on the Notman studio production, a range of independent artists and other photographic studios was also studied for comparison, through the examination of pastels, watercolours and oil paintings dating from the 1850's to the 1890's. A selection of hand-coloured portraits was examined with X-ray fluorescence to establish the presence of image forming or toning elements in the pictorial layer, indicating photographic printing on paper or prepared canvas. Those works for which results were negative were further examined with infrared photography and microscopy to determine the method of transfer used, from the possible use of a grid to image projection. Using information acquired from examination and analysis, further research was undertaken across the Museum's collections to better understand the historical context of these works and the techniques used to create them. These collections are strongly inter-related, holding, for example, the partial contents of William Notman's library, as

well as paintings and drawings not in the Notman Photographic Archives that are related in some way to a photographic process. While difficulties in the interpretation of analytical results and the relevance of historical texts were considered, certain conclusions were reached about the importance of photographic practice in the arts during this period that are pertinent to both conservation practice and historical research. The present study tracks the rapid (although often hidden and denied) adoption of photography in portraiture at a particular time and place, and affirms the ubiquity and malleability of the photograph in 19th century artistic practice.

Research into an Alternative Method for Mounting Photographs onto Aluminium Supports

Clara von Waldthausen, Lecturer & Coordinator MA in Photograph Conservation, University of Amsterdam

Adhering photographs overall to a rigid secondary support has been a common method for mounting contemporary photographs since the 1980's and 90's. Often resin coated photographs and sometimes fiber-based photographs are mounted onto aluminium, aluminium laminate boards such as Dibond®, or plastic supports that are manufactured with a pressure sensitive adhesive film covering one side of the panel. This type of mounting gives the photograph a flat, even surface gloss throughout the image that is deemed aesthetically pleasing by many photographers and artists. This effect is not easily replicated with more traditional methods of mounting using hinges, or strip-linings along the edges of the photograph and folding these over a rigid secondary support. The use of pressure sensitive adhesive films for mounting photographs is not necessarily looked upon by conservators as "preservation friendly." The mounting is difficult to reverse and films will oxidize with age. This paper discusses testing performed using electrostatic charge as an alternative mounting method to replicate the look of a photograph mounted overall to a rigid secondary support using pressure sensitive adhesive film. Testing methods will be described, achievements and impediments will be discussed and future possibilities using electrostatic charging will be considered.

Restoration of an Experimental Film: Research of an adhesive compatible with color film materials

Constance Duval, Photography conservator

During my fifth and last year (2014-2015) of studies at the Institut national du patrimoine (National Institute of Cultural Heritage) in Paris, France, I studied and worked on restoring an experimental film created by Frédérique Devaux in 2001. The film was conserved at the Centre national du cinéma et de l'image animée. The film comprises roughly 500 pieces of positive, negative and reversal colour film of different sizes (ranging from a 1-mm2 fragment to a 30-cm film strip) and is 842 cm long and 1.6 cm wide. The pieces are held together by means of a large quantity of adhesive tape. The spool of film was in fragile condition due to the detachment of a large number of the adhesive tapes holding the pieces together. To preserve the work's authenticity in terms of the materials used and their application during restoration, it was decided to keep the adhesive tape and to replace the tape that was no longer fulfilling its intended purpose with a new adhesive. Through experimental research, three acrylic adhesives used in the conservation and restoration of photographs were tested: Plextol B500, Lascaux® 303HV and Lascaux® 498 HV. A mix of Lascaux® 303HV [2:3] and Lascaux® 498 HV [1:3] was chosen for the re-gluing and repositioning of the original adhesive tape. This adhesive mix was applied dry and heat-activated. For this presentation, I propose to present the scientific research that led to the choice of a blend of adhesives compatible with the film materials at hand, as well as the application of that adhesive during restoration. The results of this research may be of interest to photograph restorers because the materials studied also exist in the form of slides, whose mounts also have to be strengthened using adhesive from time to time. Moreover, the issue of restoring adhesive tape raises ethical issues specific to contemporary works, such as the conservation of replaceable materials.

Looking Closer, Seeing More: Recent developments in the technical documentation of paintings

Ron Spronk, Professor of Art History, Art Conservation Program, Queen's University

In recent years, major advances have been made in the technical documentation of art works and in the way that these data are made accessible. New on line archives have been created that significantly improve access to existing materials, for example on Cranach and Rembrandt. More innovative are the rapid developments in the fields of 3D scanning and printing; the standardization of documentation of art works; and the documentation of especially paintings and works of paper in extreme resolutions and in different modalities such as visible light, infrared, and X-radiography. These developments are increasingly impacting art history, technical art history, and art conservation, as well as museum practices and the art book publishing industry. It is also allowing specialists to create facsimiles of art works and other cultural heritage structures with unprecedented (and uncanny) precision.

In this keynote presentation, I will discuss several aspects of these developments based on my involvement in recent and current projects such as Closer to Van Eyck and Even Closer to Van Eyck on the Ghent Altarpiece; Van Eyck Research in Open Access (VERONA); the Bosch Research and Conservation Project on Jheronimus Bosch; and The Hand of the Master on panels by Pieter Bruegel the Elder.

Combining RTI with Image Analysis for Quantitative Tarnish and Corrosion Studies

Chandra L. Reedy, Professor, Center for Historic Architecture & Design, University of Delaware; Ying Xu, Research Assistant, Center for Historic Architecture & Design, University of Delaware; Kevin Barni, Research Assistant, Center for Historic Architecture & Design, University of Delaware

Reflectance Transformation Imaging (RTI) has become an important part of the documentation repertoire of many conservation laboratories. The ability to enhance details of surface shape and color helps in discerning surface information not otherwise easily visible. RTI is usually used to obtain qualitative data, such as reading difficult-to-see inscriptions and decorative details. We have been experimenting with combining RTI with image analysis for quantitative applications. Image analysis starts with algorithms that enhance visual separation of different features in an image and mark for analysis (in a process called 'segmentation') features of a specific color, contrast, size range, and/or morphology. Satisfactory segmentation is the core requirement for successful image analysis. Once this is achieved, a variety of quantitative data on those highlighted regions can be collected simultaneously.

RTI plus image analysis is a natural coupling. Since quantitative analysis of surface features first requires the best possible segmentation, the enhanced surface detail produced by RTI is a clear advantage. One application we have been experimenting with is the use of RTI plus image analysis to obtain quantitative data on surface corrosion. The technique has been applied to coupons from Oddy tests, coated coupons artificially aged in a weatherometer, and metal sheets used for rapid corrosion tests. Oddy tests are used to assess compatibility of storage and display materials with metals found in collections. The test provides qualitative data as to whether a material is advisable for long-term use, for short-term exhibitions, or not at all. Reading the results of these exposure tests on coupon surfaces, however, can be tricky. For example, the British Museum has recommended that to reduce surface reflections from silver and copper coupons, a sheet of white paper should be held at an angle of approximately 60° to horizontal over the coupons while making assessments. Another difficulty is that control coupons themselves can change due to the elevated RH of the test. These changes have to be accounted for in making judgements about the degree of change in non-control coupons. RTI can improve the test by allowing qualitative assessments to be made under the best standardized viewing conditions. Adding image analysis allows surface effects on the controls to be subtracted from all other coupon images, and can add quantitative data on percentage of surface tarnish.

We applied this process to weatherometer tests of coatings recommended for outdoor architectural brass. Image analysis gives the percentages of pitting and corrosion products present. However, using images obtained through RTI, rather than through typical photographic or scanning methods, provides more satisfactory results.

We also used this approach to assess the results of rapid corrosion tests developed in industry to test the efficacy of corrosion inhibitors. Two indicators are important but cannot be assessed easily in one image: the percentage of surface area covered by corrosion products, and the degree of pitting attack, which has the effect of darkening the shiny, polished metal surface. Using the RTI viewer followed by image analysis these two indicators can be separated and quantified.

Towards Quantitative Reflectance Transformation Imaging

Marc Walton, Senior Scientist, Northwestern University / Art Institute of Chicago Center for Scientific Studies in the Arts; Oliver Cossairt, Professor, Northwestern University; Xiang Huang, Post doctoral fellow, Northwestern University; Greg Bearman, ANE Imaging

In this talk we will show how reflectance transformation imaging (RTI) can be used as a quantitative technique capable of visualizing and measuring the surface shape of works of art. RTI utilizes multiple images captured from a fixed camera position but lit from various different directions to create an interactive composite image that reveals textural characteristics

of materials. While current RTI methods offer conservators a powerful exploratory tool, the many systematic approximations inherent to the technique limit its use to qualitative assessments of appearance. As one step towards quantitative surface estimations, we address a fundamental limitation of the RTI model, that the whole object is lit from the same illumination angle with the same illumination intensity across the entire field of view. This requirement is rarely met in real-life experimental conditions because the light would need to be placed infinitely far away from the object. The mismatch between the lighting model and real experimental conditions has been documented to produce erroneous surface normal estimations, a "potato-chip" shape estimation error when the surface normals are integrated, and non-uniform illumination effects in relighting that we call the 'spot-light' effect. Using our new algorithm and capture methods, we show how to correct for these errors and advance RTI making it a practical and repeatable method to digitally capture the surface texture of a work of art. As a practical example to demonstrate the effectiveness of this approach, we will show high-quality 3D reconstructions of RTI data captured from the Art Institute of Chicago's collection of the graphic works of Paul Gauguin.

Infrared Imaging of Art Objects: Is It as Easy as It Sounds?

Thomas J. Tague Jr., Applications Manager, Bruker Optics

The non-invasive in-situ infrared analysis of art objects was first accomplished with single point portable analysis systems. A small FTIR spectrometer could be brought to the object of interest and a quick analysis performed. This allowed objects to be analyzed without the need of removal from the gallery or removal of small samples from the object. The analysis is accomplished by illuminating the sample with infrared light and collecting the signal reflected by the sample. A natural extension of this method would be the replacement of the single detector element with a many pixel array detector such as a Photovoltaic Mercury Cadmium Telluride (PV-MCT) focal-plane array (FPA). FPA's have been used for many years in the remote sensing of airborne chemicals, hazardous material, and spilled liquids .2-5 The conventional remote sensing infrared spectrometer with a single detector records the spectrum from a single field of view in seconds, and in contrast imaging spectrometers acquire thousands of spectra per second. As the pixels from state-of-the-art FPA detectors are small, microscopic data can be collected at high magnification over small areas or larger areas can be analyzed with less resolution. Such analyses can be accomplished in passive or active modes of analysis. Spatial and spectral information may be combined in order to improve the determination of chemical distribution. Art objects present unique challenges to the remote measurement concept. The objects typically do not emit a signal strong enough for passive detection and the introduction of a high temperature source could potentially damage the object in question. Also, traditional SiC sources were designed to illuminate small areas and had too low a power output to be useful for large fields of interest. Objects can also be irregular in shape. A preliminary study of a variety of art objects has been performed to determine the feasibility of applying full-field middle infrared imaging to objects of interest. The large depth-of-field of a stand-off imaging system like the HI90 allows almost any object to be analyzed quickly and easily.

Imaging of Analog Materials and Machine-Dependent Formats

Fenella France, Chief, Preservation Research and Testing Division Library of Congress; Peter Alyea, Sound Engineer, Library of Congress; Meghan Wilson, Preservation Specialist, Library of Congress

The utilization of non-invasive imaging techniques to capture preservation and heritage content information from a range of analog materials is becoming a common tool used in the preservation of cultural heritage. Spectral imaging expands the information that can be found outside the visible region, and by generating data-cubes of registered images, allows a range of image processing to reveal hidden content information from historic materials. While this is of significant interest for historic materials such as paper and parchment documents, it is increasingly important for modern materials that are considered restricted in being machine-readable or machine dependent for viewing. For example, a range of illumination modes has been used to capture high quality images from photographic materials such as negatives without any traditional processing. Faded information on hygrothermograph and United States Geological Survey charts with historical environmental data and fugitive inks can also be captured, providing more information about degradation processes of specific materials within different environments. This retrieval of information emphasizes the need for capture from analog materials of various materials requiring different illumination and imaging parameters, including z-plane imaging. Often the range of materials demonstrating loss of information is diverse, but they can contain supporting documentation needed for scientific studies. Two and three-dimensional imaging (2D, 3D) provides additional advantages for the capture of information from modern media carriers that are considered machine-dependent, but are easily damaged by the stylus, needle or other play component. In collaboration with Lawrence Berkeley National Laboratory the Library has been integral to the development of the IRENE system "Image Reconstruct Erase Noise Etc." a non-contact imaging system using a laser to image the surface of lateral grooves of audio disc carriers of sound recordings. Further 3D confocal imaging captures the vertical grooved information on materials such as fragile wax cylinders and field recordings, materials that would be potentially damaged if attempts were made to capture using traditional methods. The imaging system has been modified to capture information from other historic sounds recordings such

as dictabelts. For both imaging systems, spectral and IRENE a focus on standardized processing to expand the information captured has been critical. For spectral imaging, a range of software packages have been assessed and standard processing techniques compared to assure high quality and accurate data is being captured from these imaging systems. The standardization of image processing and assurance of accuracy without creation of artifacts is paramount to the utilization of imaging technologies and digital derivatives for heritage science.

Visible-Induced Luminescence Imaging: Past, Current and Future Applications in Conservation Research

Dawn Kriss, Project Conservator, Brooklyn Museum; Anna Serotta, Project Objects Conservator, Brooklyn Museum; Caroline Roberts, Conservator, Kelsey Museum of Archaeology, University of Michigan; Giacomo Chiari, Chief Scientist (Retired), Getty Conservation Institute; Marie Svoboda, Associate Conservator, Antiquities Conservation, J. Paul Getty Museum

Multispectral imaging (MSI) has seen a rapid development within the field of conservation, thanks in part to its adaptation with digital imaging techniques. One recent advance in MSI is the use of visible-induced infrared luminescence (VIL) to map pigments that might otherwise be invisible to the naked eye. This technique, first published by Giovanni Verri (2009), involves the excitation of pigments on object surfaces with visible light, and the photographic capture of the resulting emission of infrared radiation. Specific pigments, including Egyptian blue, Han blue, Han purple, cadmium red and cadmium yellow, emit infrared radiation when excited in the visible range, creating visible-induced luminescence. The ways in which this phenomenon can be captured in an image involve a wide range of photographic equipment and associated techniques, which will be the focus of this paper. The authors will discuss their own experiences at the Metropolitan Museum of Art and the J. Paul Getty Museum Villa, where this technique has been used on a wide range of projects, including both in-lab and in-gallery imaging campaigns. Conservators have also tested the technique on archaeological excavations and have found that with the right equipment (battery-powered, durable) and the ability to limit ambient light, VIL can be successfully carried out in less controlled environments. This paper will provide a review of previous and current methodology, including a discussion of image capture and processing trade-offs, and also highlight areas for future development and experimentation.

Using Portable XRF Analyzers for X-ray Radiography

Ashley Jehle, Postgraduate Conservation Fellow, Yale University Art Gallery; Renée Stein, Chief Conservator, Michael C. Carlos Museum, Emory University; Maureen R. Graves, Quality Manager Imaging Services, Grady Memorial Hospital; John A. Malko, Associate Professor of Radiology and Adjunct Associate Professor of Physics, Emory University

With over 1,200 cultural institutions owning and operating portable X-ray fluorescence (XRF) analyzers, these instruments have become familiar tools for elemental analysis of collection objects. The X-ray source in these instruments can be repurposed for use in X-ray radiography. Successful trials demonstrate this imaging application and suggest the potential for its use on a variety of objects. This radiography method enables portable, small-scale imaging capability without traditional X-ray equipment or beta plates. Tests were carried out using a Bruker Tracer III-V handheld XRF analyzer. This instrument uses an X-ray tube and is capable of producing a voltage range of 0-45kV and an amperage range of 0-60μA. The XRF unit was mounted on a tripod and operated through a computer, allowing the energy levels to be adjusted and the operator to work at a distance from the X-ray beam. The X-ray beam is emitted at approximately 45° relative to the perpendicular of the face of the unit. The instrument was positioned to compensate for this angle, ensuring the object and film were within the beam. An intensifying screen, removed from a film cassette for medical radiography, was used to aid in placement. The intensifying screen is coated with phosphors that convert X-ray energy into visible light, permitting the beam spot size, shape, and location to be viewed in the dark. As with traditional X-ray radiography, the spot-size increases as the distance between X-ray source and target increases, also necessitating a longer exposure. The current in the portable unit is 1,000 times less than in traditional X-ray radiography equipment, and therefore longer exposures are required. Fugi Super HR-T and Kodak BioMax MR films were used and developed in an automatic processor. Recommended safety protocols were followed. X-ray images were successfully produced of paper to record the watermark and wood to evaluate the length of an embedded metal screw. At the following exposures, a working distance of 15 inches resulted in a usable image size of approximately 6 inches in diameter. A sheet of handmade paper with a thickness of 0.008 inches was exposed for 30 minutes at 15kV and 45μA. The resulting image of the watermark and laid lines had less contrast than a beta radiograph of the same sheet, but took less than half the time to produce. A ¾-inch thick block of balsa wood was exposed for 20 minutes at 45kV and 43μA. The wood grain was clearly visible in the X-ray image, as was the presence of an embedded metal screw. More information about the metal screw might be obtained with different operating parameters, but the capacity of the portable instrument may limit the ability to penetrate and record dense materials.

Although not suited to all circumstances, this radiography method offers utility, flexibility, and relative ease. A watermark can be recorded without a beta plate; the presence of a pin, crack, join, etc. can be determined without a traditional X-ray imaging facility. The widespread availability of portable XRF units makes such exploratory radiography accessible for a variety of applications.

Ensuring Maximum Impact for Conservation Science

Marie-Claude Corbeil, Manager, Conservation Science Division, Canadian Conservation Institute

This presentation will explore ways to achieve effective and timely integration of conservation science into conservation practice. Two key elements for ensuring maximum impact for conservation science are research conducted in a collaborative and transdisciplinary way and proper dissemination of results. Conservation science is an integral and essential part of conservation. It provides a sound basis for informing conservation activities, by expanding our understanding of the composition, aging and deterioration of heritage materials to better care for collections, by developing improved techniques for conservation treatments or by advising on the choice of conservation materials through testing and research. Technology is constantly progressing and advances in other scientific fields are soon applied to conservation science. Techniques that were once considered sophisticated and expensive, such as Raman spectroscopy and laser cleaning, are now routinely used. The sophisticated methods of today that are not easily accessible because of scarcity or cost may become part of the arsenal of conservation scientists in a few years.

However, conservation science remains expensive, especially if one wants to take a leadership role in this field. Considering the many issues that need attention, an efficient approach is to join forces in research to find practical solutions to key issues, and to ensure that work carried out for one single institution ultimately benefits the entire community through effective sharing of knowledge.

Drawing from the author's professional experience in the context of the Canadian Conservation Institute and her knowledge of the profession, examples of work carried out on different types of objects will be used to show how research projects are designed to maximise benefits so that conclusions are applicable to other objects or collections, and how projects undertaken to answer a specific question from a single museum can generate data that, once compiled, can provide a wealth of information to the broader museum community. The presentation will also discuss strategies to involve stakeholders in defining research objectives and methodologies and to ensure active collaboration with the communities using the research results.

Colorimetric Sensor Arrays for Monitoring Pollutant Exposure of Artwork

Kenneth Suslick, Schmidt Research Professor of Chemistry, University of Illinois at Urbana-Champaign; Maria LaGasse, Graduate Research Assistant, University of Illinois at Urbana-Champaign; Herant Khanjian, Getty Conservation Institute; Michael Schilling, Getty Conservation Institute; Kristen McCormick, Art Collections and Exhibitions Manager, Walt Disney Animation Research Library

The acceptable pollutant concentration limits for sensitive artwork are generally at or below the few ppb regime: this is only ~1% of the permissible exposure limits (NIOSH PEL) required for humans. Monitoring such pollutants at such low levels is an exceptional scientific challenge, especially to do so in a cost effective fashion for a large number of locations and microenvironments (e.g., every display case in a museum). To meet this challenge, we have extended with new sensor array chemistry our already extremely sensitive and portable "opto-electronic nose" [1-4] and developed cumulative colorimetric sensor arrays. The resulting disposable sensor arrays are inexpensive, cross-reactive sensors using a wide range of chemical interactions with analytes (i.e., not just physical adsorption): an optical analog of mammalian olfaction. By digitally monitoring the change in color of each spot in the easily printed array, one has a quantitative measure of the composite response to volatiles. The use of a disposable array permits the use of stronger chemical interactions, which dramatically improves both sensitivity and specificity compared to any prior enose technology. Importantly the sensor array has been specifically engineering to be insensitive to humidity changes. A new and highly compact reader (the size of a deck of cards) for these arrays based on the color contact image sensor (CIS, used for portable business card and paper scanners) was used for these studies. We have broadened these studies by the use of cell phone camera imaging and made trial experiments in the monitoring of artwork from the Disney Animation Research Library exhibition in Beijing and Shanghai in order to monitor pollutant exposure both during shipping and during exhibition. This exhibition, "Drawn from Life: the Art of Disney Animation Studios" features animation drawings, story sketches, layouts, backgrounds, and concept art spanning the 90 years of the Walt Disney Animation Studio's history. Sensor arrays were used to monitor both exterior and interior environments of passepartout frames at the exhibition and inside the shipping crates during transport.

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Investigation of Fogging Glass Display Cases at the Royal Ontario Museum

Jennifer Poulin, Senior Conservation Scientist, Canadian Conservation Institute; Helen Coxon, Senior Conservator, Preventive Conservation, Royal Ontario Museum; Jason Anema, Conservation Scientist, Canadian Conservation Institute; Marie-Claude Corbeil, Manager, Conservation Science, Canadian Conservation Institute; Kate Helwig, Senior Conservation Scientist, Canadian Conservation Institute

This presentation will describe the scientific investigation of fogging on glass display cases at the Royal Ontario Museum (ROM). This is a serious problem, affecting many museums around the world with post-2000 display cases. At the ROM, most of the glass panels that exhibited fogging were from display cases installed in 2005-2008 as part of a major renovation at the museum. In some instances, panels showing the heaviest fogging were situated next to panels showing very little or no fogging, and on some panels the fogging revealed conveyor belt and suction cup patterns. Initial efforts to clean the fogging from the glass using commercial cleaning products were temporarily successful, but were unable to remove persistent greasy residues on the glass. The fogging returned within a year, even after multiple cleaning treatments. The fogging occurred on both the inner and outer surfaces of glass panels, in cases with and without climate control, and in cases containing all types of artifact materials.

In 2012, a project was developed and initiated by the ROM and the CCI whereby 21 panels from 16 display cases in 10 galleries were sampled on both inner and outer surfaces. Additionally, three panels exhibiting varying degrees of fogging were removed from display cases for testing. Analysis at the CCI was undertaken using several analytical techniques, including: pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS), Fourier transform infrared spectroscopy (FTIR), x-ray diffraction (XRD) and scanning electron microscopy-energy dispersive spectrometry (SEM-EDS).

The composition of the glass panels was determined to be normal for soda lime glass. The fogging residues were found to be composed mainly of sodium salts of organic compounds (such as sodium lactate and sodium salts of fatty acids) and other sodium salts (such as sodium sulfate and sodium chloride). The source of the sodium in the residues was likely the glass itself. Off-gassing experiments with paints and a floor finish used at the museum determined that those products were not likely contributing to the fogging. Rather, it was concluded that the organic acids and inorganic anions that formed the salts likely originated from normal volatile organic compounds (VOCs) and particulate matter in the air. The formation of the fogging patterns on the display cases was greatly exacerbated by the presence of greasy material on the surface of the glass. This consisted predominantly of hydrocarbon lubricants that were transferred from machinery used in the manufacture of the glass and were not successfully removed before the installation of the display cases. Because of the variation in surface cleanliness, panels with a relatively high abundance of greasy material appeared to be heavily fogged while others with a lower abundance appeared to be unfogged. A cleaning protocol using Synperonic A-7 surfactant was tested on the three glass panels that were removed. SEM imaging of the panels before and after cleaning showed that a 200:1 solution of water and surfactant was sufficient to remove all traces of fogging, cleaning and manufacturing residues from the surfaces of the glass.

Out of the Rain: Uncovering artistic process in Gustave Caillebotte's *Paris Street; Rainy Day*

Kelly Keegan, Assistant Paintings Conservator, Art Institute of Chicago; John K. Delaney, Senior Imaging Scientist, The National Gallery of Art; Pablo Garcia, Assistant Professor of Contemporary Practices, The School of the Art Institute of Chicago

Gustave Caillebotte's 1877 masterpiece "Paris Street; Rainy Day," a centerpiece of the Art Institute of Chicago's collection, was treated in 2013-14 and, along with its related preparatory drawing "Study for 'Paris Street; Rainy Day'," was given an in-depth examination as part of the Online Scholarly Catalogue "Caillebotte Paintings and Drawings at the Art Institute of Chicago." These systematic examinations included infrared reflectography (multi-spectral, 960 to 2500 nm, and hyper-spectral, 967 to 1680 nm, 3.4 nm sampling); ultraviolet and transmitted visible and infrared photography; and photomicrography. The painting was also x-rayed and thread-counted, and the ground and pigments analyzed. These investigations led to major discoveries about the artist's working process, from his initial sketch on the sidewalk of the Rue de Turin in Paris to the execution and finishing of the monumental painting. First, the combined information from the multi and hyperspectral imaging allowed visualization of the stages of underdrawing and painted pentimenti. Most notably, the technical images exposed major changes to the right side of the composition including movement of the far right building and nearby compositional edge, and the addition of the large, rear-facing figure. But that was only part of the story. To begin, the drawn sketch, that first phase of the preparatory drawing, is so accurate in its depiction of the Parisian intersection that scholars have long speculated that Caillebotte employed an optical device. Researching the likely candidates led to collaboration and recreation of this initial step at the original site in Paris, still largely unchanged in its architecture. The most likely culprit proved to be the camera lucida, a small, lightweight drawing aid in use since its development at the turn of the 19th century. Once back at the studio, Caillebotte then clarified the perspective via a set of ruled and re-angled lines, resulting in a regularized architectural skeleton. Comparing careful measurements of the drawing and painting and overlaying high-resolution, scaled images, it is clear that the first stage of underdrawing in the painting is a direct enlargement of the preparatory drawing by a factor of approximately seven. With this answer came another question: how did he do it? There was no discernable grid or obvious method of enlargement. Microscopic indentations in

the drawing, and small pinholes in the painting revealed via a high-resolution infrared capture at 2100 to 2500 nm, illuminated a possible method of transfer. A drafting tool such as calipers was used to carefully measure distances on the drawing, leaving small, almost invisible indentations. With a full-size canvas tacked to a studio wall, the enlargement process was recreated, and small tacks, placed along the horizon at strategic points, easily braced a straight edge to enable execution of the major architectural lines in linear perspective as made visible by false color hyperspectral infrared reflectograpy. After the setting was established, Caillebotte populated the scene with figures taken from a number of preparatory drawings and began to paint, constantly adjusting the composition, scraping, covering, rethinking, and repainting, until he reached the dynamic and familiar artistic conclusion.

Characterizing the Age of Ancient Egyptian Manuscripts through micro-Raman Spectroscopy

Sarah Goler, Postdoctoral Fellow, Columbia Nano Initiative at Columbia University; James T. Yardley, Executive Director of the Columbia Nano Initiative, Columbia Nano Initiative, Columbia University; Angela Cacciola, Researcher, Barnard College, and Columbia Nano Initiative, Columbia University; Alexis Hagadorn, Head of Conservation for the Columbia University Libraries, Columbia University Libraries; David Ratzan, Head Librarian of the Institute for the Study of the Ancient World, Institute for the Study of the Ancient World (ISAW) at New York University

The dry climate of Egypt has preserved thousands of hand-written documents and books, from the Old Kingdom to the Middle Ages, that can provide insight into our understanding of ancient cultures. Unfortunately, in most cases the dates of these manuscripts are unknown, although several document types bear precise dates, often to the day. For the undated manuscripts, the only current scientific method of estimating the date of writing is radiocarbon dating, but these measurements are destructive and cannot be practically used to date the media as separate from the support. In contrast, micro-Raman spectroscopy, a non-destructive light scattering technique, can be used to distinguish physical and chemical properties of materials. We have discovered that, for a study of well-dated ancient Egyptian papyri covering the date range from 300 BCE to 900 CE, the Raman spectra (25 to 40 measurements on each manuscript) of black ink all show the characteristic spectrum of carbon black materials. The spectrum of carbon black is characterized by two broad features, the G and D bands. The G band at 1585 cm-1 is a Raman allowed transition that arises from the E2g in-plane vibration of sp2 bonded carbon. The D band is a forbidden Raman transition that occurs when the lattice symmetry is broken. The D band at approximately 1350 cm-1 is associated with disorder, vacancies, crystalline edges, etc. The broad spectroscopic features are indicative of crystalline and amorphous carbon. We observed the carbon black spectra exhibit systematic change as a function of manuscript date. This observation is unexpected given the dates of these papyri cover a 1,200-year time span and the fact that each manuscript has a unique provenance, archeological, and storage history. We conclude that, over this time-period, black ink pigments in Egypt were manufactured using similar processes. We attribute the systematic change we observe in the Raman spectrum to two concurrent oxidation processes: slow oxidation of the crystalline carbon and faster oxidation of the amorphous carbon. The changes we observed are well characterized by models for carbon black Raman spectra that relate the relative intensity of the D to the G peak to defect density in accordance with oxidation. Oxidative degradation must proceed relatively uniformly over time to alter the Raman response of the material, providing a direct experimental indicator for manuscript age. Using this technique, we have been able to distinguish between the Raman spectra of different carbon-based manuscript inks on ancient Egyptian documents. Most importantly, this research establishes the basis for a simple, rapid, non-destructive method for dating ancient manuscripts from Egypt as well as the ability to differentiating between modern forgeries and authentically ancient manuscripts.

Reproducibility in Quantitative XRF Analysis of Copper Alloys: Problems and Ways Forward

Arlen Heginbotham, Conservator, J. Paul Getty Museum

This presentation will offer an overview of the challenges facing those seeking to use ED-XRF for quantitative analysis of cultural heritage copper alloys, and will describe a proposed method for maximizing the reproducibility of measurements between laboratories. By maximizing inter-laboratory reproducibility, this method should facilitate collaboration among researchers and allow the rigorous use of shared data and databases. Recently, interlaboratory reproducibility has been shown to be quite poor. The results of a 2010 round robin study will be discussed and possible explanations for the difficulties encountered will be described. The proposed method for improving reproducibility, nicknamed CHARMed PyMca, calls for the use of free, open source, fundamental parameters software called PyMca. PyMca allows for a consistent and transparent application of the fundamental parameters approach independent of the ED-XRF instrumentation used. In order to further improve reproducibility, the proposed method calls for the calibration of standardless PyMca results against a set of high-quality certified reference materials designed specifically for use with heritage copper alloys, the so-called copper CHARM set. Finally, this method calls for the calibration-to-standards to be carried out following a consistent strategy, including error modeling and the incorporation of a validation procedure. The results of a second round robin reproducibility study will be presented which demonstrate the efficacy of the method.

Binders and Pigments Used in Traditional Aboriginal Bark Paintings

Narayan Khandekar, Director, Straus Center for Conservation and Technical Studies, Harvard Art Museums; Georgina Rayner, Andrew W. Mellon Postdoctoral Fellow in Conservation Science, Harvard Art Museums; Daniel P. Kirby, Conservation Scientist, Private Practice

In conjunction with the upcoming exhibition Everywhen: The eternal present in Indigenous art from Australia, the Straus Center for Conservation and Technical Studies, Harvard Art Museums has conducted a major survey of the pigments and binders used in traditional Aboriginal bark paintings from Arnhem Land, Groote Eylandt, the Kimberley and the Tiwi Islands. Paints were analyzed for: 1. binding media using Fourier transform infrared spectrometry and pyrolysis gas chromatography mass spectrometry and 2. pigments by laser ablation-inductively coupled plasma-mass spectrometry to determine if an elemental fingerprint could be identified. Approximately two hundred samples from fifty paintings were analyzed from: Museum Victoria; Ian Potter Museum of Art, University of Melbourne; National Gallery of Australia; Art Gallery of New South Wales; Australian Museum; National Gallery of Victoria; Macleay Museum, University of Sydney; Peabody Museum of Archaeology and Ethnology, Harvard University. The following art centers provided standard pigments and binders: Buku Larrnggay Mulka, Yirrkala, NT; Tiwi Design, Bathurst Island, NT; Warringarri, Kununurra, WA. Binders were present in 77% of the samples we analyzed. No proteins, waxes, fats or blood were detected as a binder. The presence of nitrocellulose on Groote Eylandt paintings was connected to records from the 1948 expedition linking the condition of the paintings to an application of Duco to consolidate them. Orchid juice was chemically identified as a binder in a painting for the first time and was identified in the oldest bark paintings dating to pre-1878. The use of a variety of blacks from Groote Eylandt was identified as originating from natural manganese ore, dry cell batteries and charcoal. The differences in elemental fingerprints between ochres of the same location, as well as from painting samples indicates that more studies are required on a local level to determine the source and movement of ochres.

Preserving Cultural Heritage Through the Development of Digital Technologies and Community Engagement

Sarah E. Braun, Sustainable Heritage Consultant, Braun Culture, Heritage, & Development; Jessica Kaisaris, International Business Development, Octoly, Inc.

The continued threat and destruction of the world's most precious cultural heritage in Syria has left the preservation community demanding greater and more innovative efforts to safeguard and accurately document tangible and intangible heritage worldwide, in any accessible method. This proclaimed crisis is not limited solely to the actions of ISIS; rather, risks associated with climate change, natural disasters, and tourism have each taken a toll on historical monuments worldwide. This paper will explore best practices in engaging local communities to use digital platforms that archive and publish open-sourced data and 3-D mapping photographs for global audiences. It takes a particular focus on women's inclusion and empowerment to demonstrate the impact of engaging communities as a whole to increase margins of project participation, evolving societal gender roles, financial independence and women in leadership. Pulling from information and data collected from two case studies of Algeria and Morocco—which could be considered high risk areas—proven strategies for mitigating challenges associated with conservation and environmental risks (e.g. climate change), disaster risk reduction, sustainable practices and international collaboration with governments, NGOs and the private sector will be presented, analyzed and evaluated. Our findings conclude one of the most effective ways to address this ongoing crisis and urgency to preserve the world's cultural heritage must be through the development of sustainable solutions using Information Communication Technology (ICT). Furthermore, our research highlights education as a key factor in successfully engaging local communities, especially women; thus, ICT solutions are recommended to be paired with training workshops that boost interest within areas related to cultural preservation and long-term risk management. In both Morocco and Algeria, for instance, there is a strong correlation between residential proximity to historical monuments and high awareness of the intrinsic value their nation brings to the world. Ownership and responsibility are often felt, particularly among youth. Yet, often times knowledge of best practice in heritage management is not widely known, as governments continue to plan ineffective preservation solutions. As of 2015, seven of UNESCO's World Heritage Sites can be found in Algeria; yet many of the nation's tangible and intangible cultural heritage has yet to be documented. This lack of available and accessible tools to foster community empowerment and grassroots initiatives that also include the female population is an opportunity that can no longer be ignored. Actively exploring ICT solutions that build on the passion of communities as a whole—including women—can ensure present and future generations remain connected to the history of their ancestors, even if disaster strikes.

Climate Change: A new threat to our paper material heritage

Vikram S. Rathore, Deputy Manager, Conservation Center, Mehrangarh Museum, India

Northwest part of India, better known as "Thar" Desert, has always been famous for its dry climatic condition, thin vegetation cover and comparatively low biological activities. Any change in climate may lead to destabilization of its balance with surrounding living and non living things including art material heritage. Climate change is being discussed frequently at political and research level, mostly focused on environmental, industry, energy, and health. Until now it has not been considered as threat to material heritage which needs to be transmitted to future generation. Thar Desert which includes western part of Rajasthan has very rich cultural heritage, especially world famous Marwar Miniature painting on paper which consist sophisticated technique and material science, considered to be very sensitive to its surrounding climate so any change in climatic factors could initiate complex inter or intra molecular activity to cause irreversible damage in painting. In recent years as indirect effect of global warming, wind patterns are gradually changing in this region and normally blowing southwest winds are being replaced by eastern and other abnormal wind direction, as a result receiving more rain and consequently generating more moisture in air and soil, facilitating favorable conditions for microbiological activities including molds and insects. In this way climate change not only inducing destructive internal structural changes in painting but also promotes external damages as indirect or direct consequences of biological activities on and around object's surface.

An Unexpected Challenge: Can Shared Risk Make Good Bedfellows?

Lois Olcott Price, Director of Conservation (ret.), Adjunct Senior Conservator, Winterthur Museum, Garden & Library; John W. Castle, Director, Facility Services, Winterthur Museum, Garden & Library

As we absorb the increasingly dire predictions about climate change and its potentially devastating effect on our planet and cities, it is a bit overwhelming to imagine what we can do as individuals, conservators or institutions to help mitigate the risk of this disaster. We know how to deal with the results of burst pipes and leaking roofs, but the impact on entire cities – think Katrina, Sandy and the severe storms that flooded the upper mid-west, and the scope becomes unmanageable. Assuming we accept the premise that climate change is the result of increased levels of carbon dioxide and related substances in the atmosphere caused largely by the burning of fossil fuels, however, there is a role that institutions holding cultural heritage collections can play. Institutions have become major consumers of energy in their quest to provide the best possible preservation environment

for the collections entrusted to them. And most of that energy comes from the consumption of fossil fuels. The improved monitoring and control provided by building management systems and analytics provided by programs like e-Climate from the Image Permanence Institute are powerful tools in controlling and understanding our collection environments. It has also become clear that they can be powerful tools for energy conservation when paired with our growing understanding of the buffering capacity of buildings and of general collections' documented tolerance for limited environmental fluctuations. With reported energy savings of 20, 30 and even 40%, why have relatively few institutions embraced this money saving option that also significantly reduces our carbon footprint? Although all share the risks posed by climate change and are committed to preserving their collections, a lack of understanding between the facilities managers and engineers who design and maintain the systems, conservators and collection managers who care for the collection and administrators who balance the books presents an unexpected challenge. Each feels threatened in a different way, making true structural change and the long term collaboration necessary to implement and maintain a comprehensive project difficult. This presentation presents the results of a survey of members of the International Association of Museum Facility Administrators on their relationships with conservators and collection managers that also queries how this critical relationship might be improved. It also explores other barriers to a more sustainable, research based approach to climate control including exhibition loan agreements, the cost of equipment upgrades and staffing. Can these committed professionals with disparate backgrounds and priorities, form an effective alliance as they face a shared risk?

Sustainable Preservation on a Small Island: Interdisciplinary Approaches to Passive and Mechanized Environments

Jeremy Linden, Senior Preservation Environment Specialist, Image Permanence Institute; Ronald Harvey, Principal/Conservator, Tuckerbrook Conservation LLC; Jennifer Pye, Chief Curator, Monhegan Museum

In 2013 the Monhegan Historical and Cultural Museum Association received a National Endowment for the Humanities (NEH) Sustaining Cultural Heritage Collections (SCHC) Planning Grant to develop a strategy for dealing with the threat associated with high relative humidity and moisture levels to its collections and historic buildings (three of which are on the National Register). The Museum, located on Monhegan Island, ten miles off the coast of Maine, also needed to develop a strategy for the sustainable operation of its collections storage vaults due to prohibitively high energy costs on the island (fuel costs are double the price on the mainland, and electricity costs are more than 500% higher than mainland prices). This session will examine and describe the work of the interdisciplinary project team, including the museum staff, consultants in architectural preservation, objects conservation, and sustainable preservation environments, and HVAC design consultants, to develop holistic preservation plans for the historic and modern structures on site. The team used environmental data from both storage and exhibit environments, as well as data from the mechanical systems in the storage vaults, to analyze initial environmental performance, identify and confirm environmental threats, and propose, test, and assess initial experiments for future strategies. The resulting proposed strategies were a blend of passive and active environmental control, ranging from period-appropriate repairs to historic envelopes and re-routing of runoff water on the site to operational adjustments and improvements to mechanical system controls. The final report for the study provided the basis for a successful 2015 NEH SCHC Implementation Grant proposal. Beyond the significance to sustainable preservation on site, Monhegan's experience and approach serve as an illustrative case study on the potential for passive environmental management techniques in historic structures, the prioritization and decision-making process for storage of cultural and artistic holdings at a small institution, and the impact (and necessity) of interdisciplinary cooperation when formulating preservation strategies that impact the institution at a macro-level.

Achieving Competing Goals: Implementing Energy Efficient Cold Storage

Tom Braun, Senior Objects Conservator, Minnesota Historical Society; Shengyin Xu, LEED AP BD+C, Assoc AIA, Manager, Sustainability & Capital Projects, Minnesota Historical Society; Jeremy Linden, Senior Preservation Environment Specialist, Image Permanence Institute, Rochester Institute of Technology

Current industry standards indicate that audio-visual film materials should be stored in a range of 36°F to 70°F and 20-50% relative humidity (International Standards Organization); however, these ranges are often unattainable and not sustainable in the long-term for organizations. These ranges do not take into consideration the climate of the storage area (e.g. outdoor conditions) or the costs to maintain these conditions in the long-term. In 2012, NEH awarded a Sustaining Cultural Heritage Planning grant to the Minnesota Historical Society (MNHS) to conduct an interdisciplinary study that balanced issues of long-term preservation for film materials. These issues included preservation metrics, potential energy use, cost for maintenance, as well as investment cost for any recommended system or building upgrades. At the conclusion of the study in 2014, the interdisciplinary team reduced the broader set of options into a cohesive set of recommendations that include building improvements and specific upgrades of equipment. In all, the bundle of strategies will help MNHS increase the film collections Preservation Index (PI), Image Permanence Institute's measure of the "decay rate of vulnerable organic materials" in different temperature and

relative humidity conditions, while also decreasing energy use and operating costs. The study estimated an increase to the PI by 2-4 times from 100 years to a range of 200 - 400 years allowing for seasonal fluctuations. Further, a subset of critical film material will increase its PI from 100 years to 900 years. In addition to improving the long-range preservation for film collections, there is also an anticipated savings of $16,600 in energy costs per year as compared to baseline adaptations of the existing system. Since a presentation at AIC 2015, MNHS has received an Implementation Grant from the NEH Sustaining Cultural Heritage program. The goal of this second grant is to implement and test the results of the earlier study, as well as continue the collaborative process with a range of staff from collections, conservation, facilities, risk management, and sustainability, and external experts in museum sustainability, archival architecture, film preservation, and building mechanical systems. One of the significant challenges presented during this continued presentation is the design and planning for temporary storage, moving logistics, and access during the construction period. As such, this session will cover (1) the importance of interdisciplinary and collaborative processes, (2) the factors in logistics planning for temporary collections cold storage, and (3) the key factors to balancing preservation and sustainability. While the study focused on the Minnesota Historical Society's collections storage, these findings have significance for many organizations. The range of strategies examined included low capital investment cost options, such as reconfiguration of the collections by material type and the impact of passive mechanical interventions. The cost-benefit analysis of these options will provide a start for organizations to find their own path in developing energy-efficient collections storage. Further, the interdisciplinary processes utilized by the study were essential in arriving at the final solution as well as planning for implementation.

Sustainable Energy Reductions without Relaxed Environmental Criteria for a Hypothetical Museum in Montreal

William Lull, President, Garrison/Lull Inc.

Recent economics lead to challenges in meeting operating costs for collections-holding institutions. This has spurred interest in means to reduce annual operating costs by reducing energy use. This paper presents the potential energy savings from various energy conservation measures (ECMs) that can be done without relaxing the environmental criteria or otherwise placing collections at risk. These ECMs are then compared to the energy saving from relaxing the environmental criteria from 20-22 degC @ 45-55% RH to 15-26 degC @ 40-60%RH, a savings analysis presented in the paper at last year's meeting[1]. The savings are based on a block load analysis in a hypothetical building meeting ASHRAE Standard 90.1 for the building envelope, and ASHRAE Standard 62.1 for outside air. The collections space analyzed for savings is a typical museum gallery/collections use spaces in the Montreal climate. Energy rates are presented in a form so that the reader can easily convert to actual rates at their institution to project their ECM savings, with an example provided. In making the comparison, in addition to energy use, each ECM is evaluated and compared for its global carbon dioxide emissions for the energy as used in Montreal.

[1] Lull, William P.: Sustainable Energy Reduction from Relaxed Environmental Criteria in Five Canadian Cities, AIC 2015 Poster Paper; Presented at the CAC 2014 Annual Meeting on June 8 in Quebec City. [http://1drv.ms/1RiLOhp] (Full body of paper will be posted at http://1drv.ms/1KBcIzK before the end of April 2016.)

Dissociation Risks: The Conservation of Two Aboriginal Figurines and Their Textiles

Nicole Charley, Textile Conservator, Centre de conservation du Québec; Jean Dendy, Conservator of ethnographic materials, Centre de conservation du Québec

In 2011, two intriguing North-Eastern Woodlands aboriginal figurines were submitted to the labs at the Centre de Conservation du Québec. Our original treatment proposal had been based on the enchanting (but partly erroneous) history of the figurines. It was thought that they were contemporaries of a set of known mid-17th century representations of individual members of the aboriginal community who had been converted by Jesuit missionaries. Such figurines were created as a means to introduce the individuals represented to the Catholic clergy and demonstrate their religious devotion. This paper will discuss two distinct conservation issues concerning these figurines.

The first pertains to information that is lost when the caretakers of such rare and unique objects, those who are able to properly identify them, take their retirement or are lost to us without transferring their wealth of knowledge. In the current context of retirements, budget cutbacks and loss of institutional memory, we are at a critical time where the risk of dissociation of aboriginal objects in museum collections from their cultural context is increased. With the aim of keeping the younger generations of aboriginal communities connected with their culture, conservators thus have a responsibility to contribute as much as possible to the history and identification of these objects through current analytical methods and treatment.

The second part of the paper will deal with the conservation treatment of the figurines. As these objects were originally intended for study, not display, minimal treatment to non-textile components, and no textile treatment other than careful conditioning, had been at first considered. However, it became clear that consolidation (at the very least) of the textiles would be necessary as they quite literally were falling apart before our eyes. The fragility of the textiles, combined with limited access, ruled out more traditional treatments involving stitching onto a supportive backing. Fresh with ideas gained at the 2011 conference on adhesives and consolidants organized by the Canadian Conservation Institute, we began investigating consolidation of the textiles via ultrasonic misting as one of the treatment options. Though we have not come across this method used on textiles in the literature, with the encouragement and collaboration of some of our colleagues from other disciplines, we tested a number of consolidants in aqueous solutions, and successfully worked out a treatment protocol for the textiles of one figurine using this method. A second treatment option, inspired by facings, thread-by-thread repair and serendipity, was successfully used on the other figurine.

Exploring Origins and Power: The technical analysis of two Yoruba masquerade costumes

Rebecca Summerour, Smithsonian Scholarly Studies Fellow, National Museum of African Art, Smithsonian Institution; Dana Moffett, Senior Conservator, National Museum of African Art, Smithsonian Institution

This technical analysis of two Yoruba Egungun masquerade ensembles in the collection of the Smithsonian's National Museum of African Art (NMAfA) investigates the fabrics and other materials present in these colorful costumes. Egungun masquerades are traditions in which composite ensembles are worn and danced to commemorate lineage ancestors in West African Yoruba communities. Constructed from layered patchwork lappets, each eye-dazzling ensemble conceals its wearer with an assortment of fabrics and other materials, sourced locally and internationally. This technical analysis builds on prior studies that have described the contextual importance of Egungun in Yoruba culture and one conservation study in which a revolutionary mount was made for an Egungun at the Indianapolis Museum of Art.

Consultations with scholars of Yoruba cultural material are helping to illuminate the cultural origins of the NMAfA's Egungun, while research into West African fabric history aims to identify the fabric types and their sources. Characterization of the varied materials will complement this information by identifying fibers, metals, and elastomers through polarizing light microscopy and X-ray fluorescence spectroscopy at the NMAfA, as well as Raman spectroscopy at the Museum Conservation Institute. This will help date components in the costumes and plan for their long-term care in a museum context. Evaluation of the materials and manufacturing techniques in these large and complex garments will expand the biographies of these particular Egungun, which have minimal provenance, and contribute to the scholarship of Egungun and the West African textile trade. Additionally, examination of similar masquerade costumes in other museums is expected to provide a comparative look at the textiles in Egungun and may afford a starting point for understanding the aesthetics, provenance, chronology and cultural standards for their selection.

Inherent Vice in the Woven Structure of Northwest Coast Spruce Root Hats

Sara Serban, Objects Conservator, Musée McCord

This paper investigates a selection of Aboriginal Northwest coast woven hats, detailing their materials, fabrication and treatment history. It also describes current strategies undertaken for the stabilization of the hats and the decision making process applied to the care and maintenance of such a collection.

The McCord Museum in Montréal is a Canadian social history museum that counts among its many collections a rich and diverse group of First Nations objects. As a means of highlighting

this collection, the museum has mounted a permanent exhibition entitled Wearing Our Identity, which examines clothing and implements originating from several North American First Nations. The exhibition invites a discussion not only of the historical use and functionality of these objects in traditional and contemporary life, but also treats clothing as an expression of personal, political and spiritual identity in First Nations cultures. The scheduled exhibition length of five years has necessitated the rotation of objects from the collection as a means of limiting the exposure and stress placed upon such fragile artifacts. Among the objects chosen for the exhibition's rotation schedule are five painted woven spruce root hats from Aboriginal Nations on the Northwest coast of Canada. A survey of spruce root hats in preparation for this exhibition revealed that conservation treatments had been undertaken on the majority of them at some point in their history, with several having undergone multiple interventions. It was necessary to thoroughly examine these past interventions in order to critically assess changes or improvements for newer treatments. Questions arose as to whether or not some repairs were traditional Aboriginal repairs done in communities where the hats originated, or resultant from later non-Aboriginal handling. The hats, in the shape of a truncated cone with a concave disc at the top of the crown, are woven in a continuous circular line that starts at the centre top of the crown and winds its way down through the brim to the outer edge. This complex weave structure can cause deformation, splits and breaks in the finished object. Several of the treatments failed soon after they had been completed, likely due to tensions present in the woven structure. The painted designs on a few of the hats have faded significantly, and in some instances there are large areas of loss. While the general shape and materials used for the hats are similar, there are numerous differences not only in fabrication technique, but also in application of painted decoration and of pigments and binders used. However, through the process of treating and stabilizing these hats, one finds parallels in areas of weakness and their ensuing problems. Notwithstanding the aesthetic beauty of the objects, one is confronted with the question as to whether the very process used to fabricate the hats may result in inherent vice, where structural tensions in the finished product may in turn lead to difficulties in its preservation.

The Creation of a Digitally Printed Reproduction Sleeve for an Eighteenth-Century Painted Silk Dress

Miriam Murphy, Textile Conservator, Private Practice; Alexandra Barlow, Assistant Conservator, The Metropolitan Museum of Art; Eric Breitung, Research Scientist, The Metropolitan Museum of Art

This case study examines the use of digital printing for the conservation treatment of an eighteenth-century Chinese painted silk robe à la polonaise in the collection of the Costume Institute of The Metropolitan Museum of Art. The gown was accessioned into the museum's collection in 1976 with a missing left sleeve. In anticipation of the Spring 2015 Costume Institute exhibition, China: Through the Looking Glass, it was decided to use digital printing to update the previous hand-painted replica sleeve. Digital printing was chosen for its ability to more closely reproduce the textured appearance of the eighteenth-century hand-painted fabric. Although the original fabric was created with a combination of painted pigments and block printing, the two earlier hand-painted reproductions had proved that the eighteenth-century textile was difficult to duplicate with the paints and fabric available in the twentieth and twenty-first centuries. Digital printing on fabric has been in practice from the late 1990s and in use in textile conservation since the early 2000s. For this treatment, we had the experience of working closely with a skilled digital printing studio to recreate the fabric. The studio, which specializes in dyeing and printing for the fashion industry, was one of the first in the United States to work with digital printing technology. This collaboration proved invaluable to the success of the project. This presentation will illustrate the challenges faced by both the conservators and the digital printing studio in the process of recreating painted historic fabric. Through a review of the treatment from start to finish, this case study presents resources and considerations for conservators using digital printing treatments in the future.

Digital Mapping in Textile Conservation: New Documentation Methods with MetigoMap 4.0

Christine Supianek-Chassay, Tectile Conservator, Textilrestaurierung Supianek-Chassay

Comprehensive documentation is key to conservation. Successfully used for many years in the heritage sector and for the conservation of paintings, the mapping software MetigoMap is a helpful tool for object documentation, analysis as well as planning, costing and promoting a conservation project. The condition of an object can be monitored and digitally updated over years to come. The software gives the opportunity to accurately overlap historic photographs in order to analyze and compare the objects condition in the past. As a free lance conservator in Germany since 2013, I have had the opportunity to use MetigoMap in various ways. Through case studies, this paper will demonstrate the use of the software in the field of textile conservation. Examples: The analysis of 15 C. tapestry and evaluating original vs. high quality material in weaves from the 1900's. The pattern reconstruction and presentation of a rare 15 C. silk lampas through picture montage which will remain hidden to the visitor. The interpretation of the condition, detailed planning and calculating of the proposed treatment for an 18 C. wall-hanging. The software helps to record and evaluate the condition of an object in every day

conservation questions but also gives the opportunity to react quickly in a case of emergency needing only high quality pictures as an work base.

The Dark Side of the Force: Magnets, Velcro and Unintended Consequences

John D. Childs, Principal, Childs Conservation Consulting, LLC; Maureen Merrigan, Assistant Conservator, National September 11 Memorial and Museum

Opening a new museum can present interesting challenges that require nimble responses and quick thinking. Installation techniques that have worked successfully elsewhere can fail in new and unexpected ways, and procedures for handling exhibition problems may not have been developed. Conservation staff must be prepared to respond, sometimes on-the-fly, and sometimes with perseverance. In 2014, the newly opened 9/11 Museum was presented with a challenge that needed an immediate response and a long-term solution, requiring both nimbleness and stamina. Prior to opening in May of 2014, the 9/11 Memorial Museum commissioned a work from artist Spencer Finch entitled Trying to Remember the Color of the Sky on That September Morning. Consisting of 2983 watercolors on heavy paper, each painted a shade of blue, the work occupies an enormous wall in a non-climate controlled space in the museum between galleries. It has become a hugely iconic image for the museum. The original mounts for the watercolors used rare-earth magnets affixed to the backs of the watercolors. Even before the museum opened, the magnets began to attract atmospheric dust to the surfaces of the watercolors, requiring a rapidly organized program of in-situ cleaning. The program could not continue indefinitely, however. The work required a new mounting system.

Other mounting options were explored in consultation with the artist and professional colleagues, and a system using Velcro strips and acrylic pressure-sensitive adhesive was selected. The second mounting system was installed in November 2014. This system also began to fail almost immediately. Curling of the watercolor paper during the heating season in the unregulated museum space caused the paper to peel away from the Velcro in isolated instances, requiring attention by conservation staff each morning before opening. The failure of this second mounting technique was discouraging, to say the least. A third mounting system would have to be implemented. A more intensive program for exploring mounting options was developed. Various mechanical methods of securing each watercolor were explored, but all were rejected by Museum senior staff and the artist as too visually intrusive. Finally, it was decided that 4-ply mat board squares slightly smaller than the watercolors, with Velcro mechanically attached with staples, would be affixed to the backs of the watercolors using adhesive. Several adhesives were selected, and test versions were prepared and installed on the wall for a period of 21 days and then assessed for durability. Jade-R, a water-soluble acrylic emulsion adhesive was selected for its effectiveness, cost, ease-of-use and reversibility. Installation of this third mounting technique required the use of 125 substitute watercolors supplied by the artist as placeholders while the originals were remounted in rotation. The process took approximately 3 months, and was completed in September of 2015. The experience of the 9/11 Museum in mounting this commissioned work by Spencer Finch specifically demonstrates a potential problem in the use of magnets in mounts of un-encased objects, but it also demonstrates the need for flexibility, creative thinking, and cooperation in dealing with the unexpected in a museum setting.

A Material Disaster: Preservation of the Muppets

Sunae Park Evans, Senior Costume Conservator, National Museum of American History

The National Museum of American History (NMAH) had an exhibition, Puppetry in America, from December 2013 to April 2014, to feature various American puppetries which covered their 160 year history. Puppets for the exhibition included a shadow puppet, hand puppets, finger puppets, paper puppets, marionettes, a ventriloquist puppet, stop-motion puppets, and the Muppets. The condition of the puppets varied depending on the materials they were constructed from, how much they were actively used, and how they were stored. Among the NMAH puppet collections, Muppets such as Miss Piggy, Bert and Ernie, Swedish Chef, Elmo, Scooter, Cookie Monster, Count, Fraggles, and others from Sesame Street had the most conservation concerns because they had been actively used, were constructed with non-archival materials, and were damaged from storing them without proper supports. Each Muppet wears a unique outfit, hat, shoes, and other accessories in a certain way. The face elements such as eyes, nose, lips, and ears are made from different materials including plastic soup spoons, leather shoe soles, Ping-Pong balls, wood, and various kinds of fabrics. Most materials used for the Muppets were not archival since they were not expected to last forever. The most tragic issue is that some of the visible parts were made of lower-density Polyurethane foam. This foam, also known as Scott foam, is a favorable material among puppet makers because it is easy to manipulate. Unfortunately, the foam has gradually degraded and is now sticky, dry, and falling apart. This process caused many of the Muppets to lose their shapes, and to finally become deformed, collapsed, and torn. This presentation will discuss the condition of the Muppets, the conservation treatment, the materials and methods used for display form, and other issues encountered during installation.

A Biological Disaster to Costume

Mary W. Ballard, Senior Textiles Conservator, Smithsonian Museum Conservation Institute; Laura Mina, Associate Conservator, Costume Institute, Metropolitan Museum of Art; Cathleen Zaret, Conservator, Zaret Textile and Costume Conservation LLC; Carol Grissom, Senior Objects Conservator, Smithsonian Museum Conservation Institute

Natural disasters come in many forms, but rarely is an entire museum's collection inundated with a predatory insect infestation. In the fall of 2006, the Smithsonian's newest museum, the National Museum of African American History and Culture (NMAAHC), initially requested that the Museum Conservation Institute (MCI) assess and evaluate the condition of the Black Fashion Museum (BFM) in Washington, D.C. Its former director and owner, Lois K. Alexander Lane, had traveled the United States collecting garments that were designed, sewn, and, or worn by African Americans spanning the nineteenth and the twentieth centuries. She headed the Harlem Institute of Fashion before founding the BFM and moving the collection to Washington, D.C. However Lane was now incapacitated; while the family continued to manage the collection they found it overwhelming. Her daughter sought to donate the collection in its entirety to the new Smithsonian NMAAHC. The BFM filled a two-story townhouse with costume and accessories. When the Smithsonian inspected and evaluated the collection it was stored in a closed environment and infested with live carpet beetles in all stages, along with spiders. This paper will recount the survey, removal, initial treatment, and rehousing for this stunning collection that took place during 2007-2014 and the numerous participants in the early stages of BFM's recovery.

A Textile Conservator's Contribution to Disaster Preparedness at the MFA, Boston

Claudia P. Iannuccilli, Textile and Costume Conservator, Museum of Fine Arts, Boston

Soon after the planes hit the twin towers in New York City in 2001 the Disaster Preparedness Team was re-established at the MFA, Boston. I have been fortunate to be included in this committee and have worked hard to help establish and move our goals forward. Disaster Planning is an extra but necessary task for all of us at the museum. The focus of the Emergency Disaster Committee has been divided into three categories:

- Updates and Revisions of The MFA Disaster Preparedness Plan
- Preparedness: Training and Supplies
- Communication This presentation will initially look at disaster planning through a broad spectrum. Examining items important to the overall plan that directly link to the individual Emergency Action Plans for each division. Examples to be included are:
- Inclusion of FEMA's, Incident Command Structure
- Human Resource integration into the Logistics Division of the plan
- The inclusion of both information services and security for communication both on a MFA global level as well for the team itself
- Most importantly the support of the administration and the MFA community, both fiscally and verbally. The MFA, Boston includes the challenges of an off-site facility, where a third of the textile and costume collection are stored, equally important to our task.

The Disaster Plan at the MFA needs to always be seen as a document in process, adapting to changes set forth by personal, state and governmental modifications, often due to lessons learned along the way. This document includes Emergency Action Plans for individual departments but also for each division of conservation, of which there are seven. The department of Conservation and Collection's Management has been an important contributor over the years to our preparedness goals. Many individuals at this meeting today have been instrumental in establishing and acquiring needed supplies, stored throughout the building. This includes supplies necessary for our "Backpack Team," ready at a moment notice to quickly get to an individual incident or gallery around the building.

I will illustrate how our Emergency Action Plans work using the plan for the collection of Textiles and Fashion Arts. This is an example of where conservation and curatorial have constant communication on a regular basis, both due to location as well as oversight of the collection. Working together has been essential over the years for both training as well as during individual incidents. This paper will conclude with a discussion of recovery guidelines for textiles established in this EAP.

Vial Things: Preserving the Unexpected in the Occult Jewelry of Simon Costin

Sarah Scaturro, Head Conservator, The Costume Institute, Metropolitan Museum of Art

Vials of evaporating semen and decaying, greasy turkey claws – these are not things usually associated with high fashion. Yet just like modern art, contemporary fashion is created from unexpected materials often designed to shock and titillate, thus creating unique challenges for fashion conservators. Recently, two necklaces by the British designer Simon Costin and held in the Metropolitan Museum Art's Costume Institute collection underwent examination, treatment and storage rehousing in order to address issues related to the preservation of the biological specimens integrated into them.

The first necklace, titled "Incubus" (1987), is composed of copper wire, silver sperm motifs, and five glass vials filled with semen and mounted in partial silver casings. The conservation challenges in this necklace were primarily related to storage, since an interview with the artist revealed that the semen had been evaporating slowly over the past three decades. Inspired by

preservation methods typically used for fluid-preserved biological specimens, innovative solutions were explored including the use of micro-chambers, anoxia, cyclododecane, microcrystalline wax, and cold storage. The second necklace, titled "Memento Mori" (1986) contains two taxidermied turkey claws and three rabbit skulls, along with Victorian lace, wooden beads, and hematite. The challenge for this necklace was two-fold: the turkey claws and rabbit skulls had been improperly prepared, and were subsequently exuding grease (claws) and showing mold (skulls), and the necklace was also found to have been infested. Informed by methods used in natural history collections, the treatment and storage solution for this necklace explored degreasing methods and long-term anoxia. The preservation campaigns for both objects underscore the requirement for a multiplicity of approaches for the conservation of contemporary fashion, the necessity to engage with other conservation disciplines in order to find effective solutions, and the benefit of conducting a designer interview in order to deeper understand artistic intention.

Assessing Collection Emergency Training and Response: The Risks of Adrenaline

Lois Olcott Price, Director of Conservation (ret.), Adjunct Senior Conservator, Winterthur Museum, Garden & Library; Dr. Joelle D. J. Wickens, Conservator, Head of Preventive Team, Winterthur Museum, Garden & Library

The rains fall; the winds howl; the earth moves; bombs explode; pipes and mechanical systems fail and cultural collection stewards gather to address the heartbreaking results. Every scenario brings its own challenges and risks - are these highly motivated but stressed responders among them? How do we insure we mount an effective, safe, well planned response?

Most disaster training programs begin with fairly extensive instruction in planning and preparation. They then briefly discuss assessment before moving forward to what many regard as the heart of the program, recovery and salvage. A hands-on drill of varying length, complexity and intensity often climaxes the program. After designing and implementing many of these programs and drills, the authors have reached the conclusion that the emphasis on response and salvage while minimizing the role of assessment, communication, team structure and function can derail an effective response and cause additional collection damage and dissociation. Establishing a team and communication methods comes first. Without this foundation, assessment and recovery that is successful for people and objects is rare. Assessment occurs before recovery begins and at regular intervals as the response continues. It identifies the nature and scope of the collection emergency and the resources, documentation and strategies necessary for each stage of an effective response. When these steps are truncated or ignored, even in a drill, chaos often ensues. Too many anxious and adrenaline soaked responders rush in to save the collection. They get in each other's way, forget the need for documentation, and move objects without adequate regard for priority, condition, risk or appropriate destination.

This presentation addresses the assessment options in a collection emergency plan and scenarios for team development, communication and assessment training. Each responder's foundational knowledge, experience, collection familiarity and emotional response to a collection emergency vary. Training must be tailored to the participants, whether students, cultural heritage professionals, or volunteers.

Foxy Underpants; Or, the use of chelators, enzymes, and surfactants to remove foxing stains from linen underpants

Laura Mina, Associate Conservator, The Costume Institute, The Metropolitan Museum of Art

This paper describes a successful treatment to reduce foxing stains on a pair of men's linen underpants ca. 1830 in the collection of the Costume Institute at the Metropolitan Museum of Art. The underpants are ankle length, with a wide waistband containing 12 baleen stays. Such undergarments are rare in museum collections, yet provide a reminder of the importance of fashionable bodies for men. Foxing stains can be disfiguring on any work of art, but the stains were considered particularly distracting on the underpants.

While foxing stains are a common problem in textile collections, most recent studies have focused on paper collections. Building on research by paper conservators and scientists, this treatment addressed the metals and microorganisms that cause foxing stains. Rather than use bleaching agents, the underpants were wet cleaned in a series of baths with the chelator ethylenediaminetetraacidic acid (EDTA), a lysing enzyme, and sodium laurel sulfate surfactant. An agarose poultice with hydroxybenzyl ethylenediamine (HBED) was used to target an area with dark stains. In both visible and ultraviolet light, the stains showed considerable reduction after the treatment.

Gelling in Theory and Practice: An Examination of Agarose Gels in Textile Conservation

Emma Schmitt, Andrew W. Mellon Fellow in Textile Conservation, The Denver Art Museum; Sarah Foskett, University Teacher, The University of Glasgow

Recent developments in poultice treatments have led to the introduction of agarose into textile conservation and innovations in its application. First used on paintings, agarose has rapidly transitioned into through specialties with limited research underpinning its effect on different materials. For textile conservators, the movement of moisture in an object can have a profound effect on cleaning, resulting in tidelines, dye bleed or damage to

finished fabrics, making control of the introduction of moisture paramount for the use of poultice systems. Translating the use of this material from published literature into actual practice has proved challenging, as predicting how these gels will work on different materials is difficult.

This paper will examine dissertation research completed at the University of Glasgow to better understand how the chemical and physical properties of agarose can been used in conservation to predict how they will work and facilitate successful treatments. Focus will be placed on the properties of agarose gels as discussed through research in the areas of food science and biology. Further discussion of the properties listed by chemical companies will aid in clarifying purchasing criteria. This will be assessed alongside results of tests utilizing these gels on a textile substrate to better understand how the theoretical information presented in food and biological sciences inform and effect the practical use of these materials.

Current available literature on the use of agarose in conservation is limited in its discussion of gel properties and their manipulation to facilitate the use of the gel for treatment. The dissertation allowed focus to be placed on these properties, first discussing what they mean and how they may affect how the gel works. These properties represent may of the theoretical principles that may have an effect on how the gel responds in actual practice. Clarifying what they mean, and then testing the gels allowed for a better understanding of properties verses practice.

The experimental phase of the dissertation project focused in textile materials. Three fibres, cotton, wool and silk were tested using three concentrations of agarose and two different gel depths. The results showed that the success of a treatment is dependent on the material being treated but also on the depth and concentration of the gel. This paper will focus on the results of this testing and how the properties of the gel affect the success of the treatment.

This paper will build on the existing body of literature on the use of agarose in conservation. By providing a source that explains the basic properties and their effect on how the gels will respond during treatment, this paper will help facilitate their use within the field, providing a starting point for understanding how the physical properties work together. It will highlight how understanding how to manipulation of working properties can be an effective tool in controlling how moisture moves through a substrate, making the transition from theory to practice easier to predict.

Tips and Tricks to Remove the Mud from Textile Collections after a Flood

Gail Niinimaa, Textile Conservator, Niinimaa Enterprises Inc.

In the spring of 2013, flooding occurred in southern Alberta which submerged the storage facility of the Museum of the Highwood in High River. Due to the extent of the damage to the town, it was 10 days before any salvage or recovery could happen. Some initial recovery was done in July 2013, but the remainder of the collection was frozen in July and thawed from Jan – June 2014. When faced with the conservation of over 500 textile items that had been submerged in muddy water for that long; the traditional, conservative methods of textile conservation treatment needed to be modified in some ways. This paper will show some of the treatments that occurred during this recovery/treatment effort and how resilient the textiles were to some very aggressive treatments that were done in order to remove the fine river silt. Pieces that appeared to be completely ruined turned out to quite resilient to treatments that wouldn't normally be considered - surprisingly very good results came out of some of these drastic treatments and many pieces were able to be salvaged.

This paper will discuss some of the surprising successes that occurred and will highlight the way that DTPA was used to help sequester the dirt from the muddy textiles, as well as pre-soaking and spraying techniques that were done. In the fall of 2014 – secondary treatment was done on many of textiles salvaged initially and the paper will also discuss how more than one treatment is often needed to completely remove this type of dirt.

Embers in the Ashes: Challenges Encountered During the Restoration of Fire-damaged Woodwork in a Historic House Museum

Amanda Salmon, Conservator, Furniture and Heritage Interiors, Canadian Conservation Institute; Deborah Hudson, Former Heritage Conservation Advisor, Formerly of The Land Conservancy of British Columbia (TLC)

This paper will share lessons learned from recovery efforts in response to a fire at a historic house museum, and in particular from the use of commercial dry ice blasting services to remove charred wood from damaged woodwork. In January 2009, the interior of Craigflower Manor National Historic Site in Victoria, British Columbia was severely damaged by a flash fire caused by an electric heater located beneath its central staircase. Catastrophic charring reduced the thickness of most of the wooden members composing the substructure of the staircase by up to 50% and caused extensive damage to surrounding architectural millwork and interior surfaces.

In an attempt to salvage the heritage character-defining fir and arbutus staircase, site custodians, The Land Conservancy of British Columbia (TLC) contacted a commercial disaster restoration company shortly after the fire to advise on the removal of the charred wood. The restoration company suggested dry ice blasting. The Canadian Conservation Institute (CCI) was also contacted for advice, resulting in a site visit to inspect the damage, observe the blasting, and provide recommendations for the restoration of damaged architectural woodwork. The operator demonstrated the dry ice blasting and the technique proved to be a well-controlled reduction method for the charred wood. At the request of TLC, the restoration company sealed the doors of several adjacent rooms and erected a polyethylene sheeting tent to isolate the staircase and protect the interior during blasting. Although the restoration company confirmed that dust extraction equipment would be installed in order to capture the primary waste generated by the blasting, after the work was conducted and re-entry was permitted, it was immediately apparent that adequate dust extraction was not installed and the isolation tent had failed. It was also evident that attempts to seal off some adjacent rooms from the dust were insufficient. Not only was the air thick with carcinogenic particulate, but a substantial deposit of charcoal dust had settled on all surrounding horizontal surfaces including those of the artifacts displayed in several rooms.

This paper will elaborate on the circumstances of the initial disaster and the ensuing complications caused by the insufficient capture of primary waste from the dry ice blasting. It will describe the recommendations provided by CCI for the treatment of the interior millwork and will share results from the restoration project led by TLC. Finally, it will offer precautionary advice for those who might consider the use of commercial restoration services to remove charred building materials within a historic structure damaged by fire.

Choices and Triage: The impact of early decisions on future treatment options.

Steven Pine, Senior Decorative Arts Conservator, The Museum of Fine Arts, Houston

After the water recedes or fire is extinguished important choices begin that can dramatically impact the nature of intervention, costs involved, and treatment options available to stabilize and restore collections in subsequent weeks or months. Many times these decisions are made by staff and consulting conservators under extra-ordinary stress and limited time for consideration. Though the hard decisions are made by collection management in discussions with conservators and insurance adjusters in due course and with time for deliberation many treatment choices are set in motion during the process of triage. This presentation will examine a range of decorative arts materials as they were found during or immediately following triage for water damage followed by a discussion that considers treatment options informed by hind sight from past disasters. The audience will respond to examples given with their preference for triage recommendations and potential treatment outcomes by using class room clicker technology. The resulting survey will be discussed and be published in the post prints as a reference tool for future disaster responders faced with similar choices. Better informed future triage will hopefully lead to improved outcomes.

A Ghost of the Civil War: A Man, a Flag, and a Frame

Camille Myers Breeze, Director, Museum Textile Services; Melissa H. Carr, Masterwork Conservation

For decades people walked through the basement of the Lowell Memorial Auditorium in Massachusetts and never noticed the big, dirty frame propped against a piano. Then in January, 2014, two employees stopped, looked, and called the Greater Lowell Veterans Council to tell them that they had found something extraordinary: a tattered flag encased in an elaborately carved frame. Decipherable on the inner frame was an inscription reading, "Under this flag at Clinton, La., on June 3, 1863, Solon A. Perkins was killed." Perkins, according to the bronze plaques upstairs in the Hall of Flags, was one of nearly 500 men from Lowell who died in the Civil War. Wooden artifacts conservator Melissa Carr took delivery of the frame and began the process of cleaning, stabilization, and compensation for lost elements. Camille Myers Breeze received the flag, which lay beneath the brittle glass and was glued and sewn to a sheet of century-old cardboard. Both the flag and the frame had damage caused by use, time, neglect, previous mounting campaigns, and souvenir hunters. At each step of the project, members of the board of the Greater Lowell Veterans Council collaborated with insight and decisiveness about levels of restoration. On May 31, 2015, the frame and flag were reunited and unveiled in the Hall of Flags to

an audience of veterans and civilians. What had appeared at first to be a case of woeful neglect was, in fact, the rediscovery of a legacy of preservation, respect, and civic pride for a man and the flag with which he died.

Aspects of the Manufacture of Chinese Kuan Cai Lacquer Screens

Christina Hagelskamp, Assistant Conservator, The Metropolitan Museum of Art

The kuan cai technique was introduced in Chinese lacquer workshops around the middle of the seventeenth century. Translated as 'cut color', the term succinctly describes the manufacturing process during which a wooden substrate is covered with thick foundation layers and a top coat of Asian lacquer. Motifs are cut through the lacquer into the foundation and the surfaces of the resulting recesses are subsequently painted in a great variety of colors and accentuated with gold leaf. Best known in the western world for its use in large-scale screens, here the technique is commonly referred to as Coromandel or Bantam lacquer. Initially such room dividers were produced for the Chinese domestic market, often to commemorate a government official's anniversary or retirement. Soon, however, they became a popular export article for the European market, where the vibrant polychrome decoration was beloved as an exotic decorative element in the interiors of palaces and mansions. In this presentation three case studies of kuan cai lacquer screens from the Kangxi period (1662-1722) will be highlighted: two intact screens produced for the Chinese domestic market and a large set of panels created from three exported screens that were integrated into a seventeenth-century Dutch interior. A thorough technical study revealed details regarding construction and material composition, including variations in joinery and materials used for priming, lacquering and painting. Production techniques for transferring designs onto the prepared lacquer surfaces were determined through the examination of tool marks and comparing nearly-identical designs using computer-aided superimposition. Finally, a variety of degradation patterns - delamination of foundation and paint layers, as well as increased friability of underbound pigments - were studied in regard to both technique and material composition. This comparative study will hopefully provide a better understanding of kuan cai lacquer screens and give direction for further research into their technical aspects and appropriate treatment methods.

Colonial Spanish American Lacquered Objects at the Hispanic Society of America

Monica Katz, Conservator, Hispanic Society of America

The Hispanic Society of America has a small but very fine collection of colonial Spanish American lacquered objects, decorated with two principal lacquer techniques, barniz de Pasto and Mexican lacquer or maque. Made using indigenous techniques for a European aesthetic which mimicked Asian lacquer, this group of exquisite objects demonstrate the extraordinary craftsmanship of these largely anonymous artisans whose techniques are still in use today in Colombia and Mexico. The colonial objects range in shape from indigenous forms such as gourds and bateas, large wooden bowls, to more traditionally European shapes and decorative domestic objects such as caskets, chests and small boxes, and even larger pieces of furniture such as wardrobes, secretaries, tables and folding screens. Colonial Spanish American lacquers are often misidentified as painted or japanned, or even as the Asian lacquers they sought to imitate. There have been few studies on these objects and only now conservation scientists have begun to conduct materials analysis to identify and establish the properties of these lacquers that originally were used to waterproof gourds, wooden objects and leather. MFA Boston's conservation scientists have been analyzing samples from HSA's lacquer objects and initial results confirm the contemporary records that describe the manufacture of these objects as well as reveal some surprises. This paper will focus on the Hispanic Society's collection and will collate the information known so far about these two techniques: describing the process whereby these objects were made and decorated, using the intricacies of the techniques and stylistic parallels to arrive at a tentative theory about timelines and workshops.

Ghostly Evidence: Interventions in a 20th century installation of 18th century Asian lacquer panels

Charles J. Moore, Conservator, Preservation Society of Newport County; Melissa H. Carr, Masterwork Conservation

Over the period 2007-2013 a campaign of research, documentation, and conservation treatment was undertaken for a group of 18th c Chinese lacquer panels, as well as an early 20th c panel added to the set, in the Breakfast Room of The Elms located in Newport, Rhode Island. The Elms is a Beaux Arts mansion (1901) designed by Horace Trumbauer with interiors by Paris decorator Jules Allard for Edward Berwind, a coal magnate. It has been owned and administered by The Preservation Society of Newport County since 1962. The antique lacquer panels likely came from Canton to France in the mid-18th c as part of the China Trade. They probably enjoyed a period of high style in a Parisian town house; suffered subsequent degradation, salvage, and storage; followed by restoration/modification and reinstallation at The Elms. The work revealed a variety of techniques, repairs, and modifications using both Asian and Western materials and methods. Assumptions were made early in the examination that were refuted by evidence discovered later, with the greatest surprises found in the 20th century work. Cross section microscopy and scientific analysis that provided solid details about craft

technique and materials was vital for the final interpretation, which also depended upon evidence provided by a collection of vintage photographs and the discovery of visual details previously unseen. All this provided material for an interesting and surprising chronology of construction and intervention by a cast of characters, some known, some intuited, and others of mysterious origin.

This presentation will document the specifics of our dependence on the microscopy and the analysis for concrete details regarding past work, the context of that work as we understood it to date, and especially the efforts of the somewhat ghostly practitioners whose evidence we see and interpret. It is hoped that future research will put flesh on their bones.

The ABCs of a Monumental Frame: Analysis, Bronze Paint & Chelators

Carola Schueller, Furniture and Wooden Objects Conservator, Schueller Conservation Services; Allison Jackson, Frames & Gilding Conservator, Allison Jackson Gilding and Frame Conservation; Adeline Lutts, Conservation Engineer, Museum of Fine Arts, Boston

This paper focuses on the technical examination and the conservation treatment of an 18th century English carved and gilded frame of monumental size. The project is exemplary in that results of the study of 25 cross sections are compiled and a protocol is developed for large-scale gilding conservation including bronze powder paint removal. Cross sectional analysis and an intense examination confirm the presence of both water and oil gilding - the two main gilding techniques employed in 18th century England and described in contemporary literature.

In Summer 2014 a generous friend of the Museum of Fine Arts, Boston lent (and later donated) to the museum a large altarpiece painting by American born painter Benjamin West "Devout Men Taking the Body of Saint Stephen" from 1776. Its frame, original to the painting, is an exquisite example of a Carlo-Maratta frame. It is made of long individual pieces of wooden molding skillfully carved with complimenting repeating patterns assembled together, on the same frame molding, to appear as one unit.

The frame showed two generations of gilding under a layer of corroded bronze powder paint. To aid in understanding the frame's history and the frame's original gilding scheme an extensive technical examination was undertaken. This involved taking 25 samples of representative areas of the different molding elements. One of the major questions was to determine which areas had been originally water-gilded or oil-gilded. In order to better understand cross sections of the frame, sample boards of water- and oil-gilding were examined too. It was found out that burnished water-gilt areas were skillfully placed next to matte oil-gilt areas in a pattern to maximize the effect of the gilding on the frame as a whole. The other most interesting and challenging aspect of the project was the removal of darkened and heavily oxidized bronze powder paint. Extensive tests with a wide range of both polar and unpolar solvents, and solvent blends were executed. Gels were made of promising solvents. Unfortunately there was no solvent or solvent blend that successfully removed the bronze powder without damaging the second generation of oil-gilding underneath. Since the binder could not be solubilized, methods were investigated to target the metal powder itself. A series of chelator gel recipes were tested before one with EDTA as the acting ingredient with a pH of 8 was chosen. This paper will discuss the problems of removing bronze paint over oil-gilding and the different application techniques and methods used to reduce corroded paint. The project's procedure is exemplary for large scale gilding conservation and helps to inform colleagues in a field that often times is overlooked in the museum community.

Loss Compensation on Furniture: Traditional vs Modern Methods and Materials

Behrooz Salimnejad, The Elaine S. Harrington Senior Conservator of Furniture and Woodwork, Philadelphia Museum of Art

Behrooz Salimnejad has worked in the Furniture Conservation Department of the Philadelphia Museum of Art (PMA) since 1992 and has utilized both traditional craft techniques and modern conservation methodologies for loss compensation. In this presentation he will discuss the factors that led to choosing a suitable approach for different types of loss, including gilding, wood carving and turning. In some cases multiple methods were utilized on the same object. Highlighted treatments will include: replacement of missing feet and turned elements on a chair designed by Frank Furness (American, 1839 – 1912); compensation of abraded sections of gesso and gilding as well as missing carving on a sofa by John Linnell (English, 1729–1796); and carving of swags on a table by Sefferin Alken (English, 1717 – 1783).

To Fly or Not to Fly, That is the Question: Conservation of a John Doggett Frame at Pilgrim Hall Museum

William B. Adair, Lead Conservator, Gold Leaf Studios, Inc.

In May 2015, Gold Leaf Studios was contracted to conserve an original John Doggett frame at the Pilgrim Hall Museum in Plymouth, Massachusetts. The conservation of the frame was to be performed in conjunction with the conservation of the 1824 painting Landing of the Pilgrims, by Henry Sargent.

During a preliminary discovery trip to determine the current condition of the frame, the studio conservation team determined that, in addition to numerous areas of damaged ornamentation, large sections of the frame were covered in bronze paint that had oxidized over time. The team also found that the original water gilding was encrusted with 180 years of flyspecks.

A primary objective of treatment was to remove the bronze paint and flyspecks from the frame. The conservation team experimented with several gels and solvents to determine the method that was least likely to disturb the water gilding underneath. The team developed a new technique of treating the surface area in a poultice to remove surface degradation and save as much of the original gilding as possible.

Branch Surprises: Anatomy, identification and conservation concerns

Mary-Lou Florian, Research Associate, Royal BC Museum

We think of branches as sturdy things and in an object they are nothing to worry about. Branches are used in a multitude of ways in a great number of ethnographic artifacts. It can be intact or altered by splitting or removing just the outer bark, phloem or pith or leaving just the woody xylem. Each part of the branch has specific anatomical features that have there own vulnerability and they also can help with identification of its species. Our concern is climate change and water problems. All branches are full of starch and some with sugar based mucilage and these make them more responsive to high humidity and more vulnerable to fungal or insect infestations. Its important to know this. It may involve a new approaches at storage and display.

In Situ Chelation of Waterborne Stains from Historic Unfinished Architectural Woodwork

Melissa McGrew, Architectural Conservator, Building Conservation Associates, Inc.

New England's winter of 2014/2015 brought a stunning build-up of snow to the region and the c. 1681 Old Ship Meeting House, a National Historic Landmark in Hingham, Massachusetts was not spared. Ice that formed at the exterior window heads melted and penetrated the wall surfaces resulting in dark staining at the impressive, original interior wooden timber frame members. When testing was initiated seven months following the initial damage, the stains proved to be intractable to simple water removal. Suspecting that this dark reddish staining consisted, at least in part, from aqeuous interactions with ferrous oxides, corrosion from the nongalvanized building nails, BCA designed and tested a custom gelled dual chelator cleaning approach. The procedure proved to be effective at significantly reducing the waterborne stains from the unfinished woodwork without causing any further damage. This presentation will discuss the properties and results of the cleaner BCA produced and utilized on the interior woodwork.

Going Grey: Mitigating the Weathering of Wood in the Architecture of Louis Kahn

Andrew Fearon, Chief Architectural Conservator, Materials Conservation; Shuyi Yin, University of Pennsylvania

Louis Kahn's attitude towards natural materials was expressed in his documented preference to allow exterior wood siding to be left unfinished and weather to a silver grey. Influenced by vernacular architecture of the American and Canadian rural landscape, this reference to traditional construction has proved a challenge for stewards as exposure to the elements is in the end consumptive. Exacerbated at times by past treatments such as the application of film forming coatings proved equally problematic contributing to eventual replacement. Like many works of the modern movement that retain their original siding, Kahn's wood clad structures stand at a critical crossroads where the architect's intent and retention of fabric converge. Within the confluence of these values new solutions for intervention have emerged via more sustainable and sensitive maintenance cycles.

In 2014, a treatment program for Louis Kahn's Korman House was formulated based upon field test panel evaluations and laboratory work conducted at the University of Pennsylvania to specifically address the weathering and biodeterioration of exterior wood within the context of heritage conservation. This work is currently under implementation and scheduled for full execution in the spring 2016.

A Methodology for Documenting Preservation Issues Affecting Cultural Heritage in Syria and Iraq

LeeAnn Barnes Gordon, Project Manager for Conservation and Heritage Preservation, American Schools of Oriental Reserach (ASOR) Cultural Heritage Initiatives; Bijan Rouhani, Project Specialist in Risk Management and Built Heritage, ASOR Cultural Heritage Initiatives; Allison Cuneo, Project Manager, ASOR Cultural Heritage Initiatives; Susan Penacho, Project Manager of Geospatial Imaging

Armed conflict in Syria and Iraq has resulted in a humanitarian crisis with hundreds of thousands of casualties, millions of refugees, and nearly twice as many millions of internally displaced persons. As violence and extremism continue to escalate, so too, has the destruction of cultural property, another dimension of the humanitarian crisis. Following the first few years of the war in Syria, international responses for heritage protection increased rapidly, including the formation of the Cultural Heritage Initiatives (CHI) project in August 2014. CHI is a cooperative agreement between the US Department of State and the American Schools of Oriental Research (ASOR) to implement cultural property protection by documenting damage, promoting global awareness, and planning emergency and post-war responses. This paper discusses the development of CHI's methodology for documenting preservation issues affecting cultural heritage in Syria and Iraq. Since the onset of the war, thousands of cultural properties have been damaged through combat-related incidents, theft, and intentional destruction. The CHI project has developed a remote condition assessment methodology with aims to better understand the types and patterns of threats and damage, which will inform future safeguarding and post-conflict restoration efforts. The CHI condition assessment process is closely linked to other activities of the project, including the development of a digital inventory and map of heritage sites using Arches heritage management software and the archiving of information about cultural heritage from major news outlets, online media, satellite imagery, and in-country sources.

To integrate the assessments with CHI's digital inventory, the methodology was initially based on the Arches Condition Assessment module, designed primarily to record the physical condition of a property and threats and/or disturbances. Terminology and evaluation scales were adapted in part from the MEGA Jordan Guidelines (the underlying schema used in Arches) and other sources, with the addition of terms more specific to armed conflict and a unique category for Military Activities. A Condition Issues section was developed in order to track the effects of damage and the components of a property that may be affected. Later additions include a section designed to rate the priority for an on-the-ground assessment in the post-conflict period. CHI has engaged heritage experts to test and provide feedback on the methodology, which has been used to make revisions and improvements. One of the biggest challenges has been to design a system that is flexible and can provide meaningful data despite the inability for assessors to observe the cultural properties firsthand. Differing from traditional condition assessments, this lack of primary observations has led to an increased emphasis on recording sources of information and an awareness of the reliability of the data used to complete an assessment. However, initial results of assessments of properties within the UNESCO World Heritage Site of Ancient Aleppo indicate that the process provides useful data, and it is anticipated that broad trends in the heritage situation will emerge and priorities for preservation efforts will be identified as larger areas are assessed.

The Outdoor Sculpture Project at the Getty Conservation Institute

Rachel Rivenc, Associate scientist, Getty Conservation Institute; Julia Langenbacher, Research Lab Assistant, Getty Conservation Institute; Catherine Defeyt, Graduate Intern, Getty Conservation Institute; Tom Learner, Head of Science, Getty Conservation Institute

The Getty Conservation Institute (GCI) has embarked on a long-term research project into the conservation issues of contemporary outdoor sculpture, stemming from the recognition that outdoor sculpture is by its very nature prone to damage, often requires treatments that in other areas of conservation would be considered extreme, and that a significant body of research on this category of objects is needed. The initial phase of this project focuses on painted outdoor sculpture. Five different research strands were designed based on the outcomes of a focus meeting organized in June 2012 by the GCI, aiming at exploring issues posed by the conservation of twentieth-century and contemporary outdoor painted sculpture, and discussing possible solutions and areas of research. The meeting gathered thirty participants from the main groups involved in the conservation of outdoor painted sculpture: conservators, artists estates, foundations and studios, paint industry professionals, collection managers, and curators. One of the central goals of the project is to build bridges between industry and the conservation profession. The project activities include:

- Documenting Original Painted Surfaces. It is fairly common for outdoor painted sculpture to be entirely repainted, and frequently stripped if they exhibit deteriorated paint layers. This component of the project aims at defining protocols for the documentation of painted surfaces that can be easily adopted by conservators — including how to prepare coupons, photograph them, and measure color and gloss in the easiest yet most reproducible ways.
- Analyzing and Understanding Paint Composition. Industrial paints have very complex composition. Part of the project consists of developing analytical protocols specifically adapted to paints used for outdoor painted sculptures and building analytical libraries to more accurately identify them.
- Developing New Paint Systems. The requirements for paints

used in outdoor painted sculpture conservation are complex: they need to replicate the original artist materials, while being as durable as possible in outdoor environments and accessible in terms of cost. The Army Research Laboratory (ARL) has been working to investigate new paint formulations suitable for conservation.and the GCI has partnered with the ARL and Abigail Mack Art Conservation to test these new paints and make them available to conservators.

- Collaborating with Artists' Estates, Foundations, and Studios. The project team is collaborating with artists', estates, foundations, and studios (EFS) to discuss how these organizations can provide conservation professionals with guidelines for repainting outdoor sculpture, focusing on the works' visual properties—color, gloss, and texture—and how best to replicate these using available paint resources.
- Case Studies: The project includes a number of case studies – in the past two years the GCI has partnered with the University Art Museum at California State University, Long Beach to treat selected sculptures from the outdoor sculpture collection at CSULB, as well as to organize the conference: FAR-SITED: Creating and Conserving Art in Public Places in October 2015. Other potential case studies are being explored in collaboration with the Storm King Art Center. The presentation will give an overview of the project and present results and achievements to date.

The Effect of an Unexpected Spring Thaw in Montreal: Natural Disaster as 'Fifth Business'

Brittany Webster, Conservator, Conservation of Sculptures, Monuments and Objects (CSMO)/B. Webster Art Conservation & Design; Anne MacKay, Head, Conservation, McCord Museum; Alexander Gabov, Owner and Head Conservator CSMO, Conservation of Sculptures, Monuments and Objects (CSMO)

At precisely 4:30 a.m. on March 11, 2015 a large block of ice fell from the roof cornice of McCord Museum; gained momentum over several storeys and smashed through the north end of a glass and metal sculpture below. This unexpected accident lead to the complete dismantling and conservation of Pierre Granche's Totem Urbain/Histoire en dentelles, one of the Montreal artist's major public commissions, completed in 1992.

Totem Urbain/Histoire en dentelles pays homage to both past and present Montreal, its geography and culture. Composed of 17 elements in brass, six levels of glass panes and fragments, atop an aluminum substructure, the entire sculpture both figuratively and literally bridges the old and new McCord edifice, located along Victoria Street.

While regular maintenance had tracked and mitigated preservation issues typical in the care of an outdoor sculpture – such as vandalism, theft, the effects of pollution, dirt, biological growth and debris, as well as the inherent vice of materials and techniques used, the sudden and violent impact on the sculpture from falling ice presented a unique opportunity to the McCord Museum: it not only allowed for the repair and replacement of damaged glass and metal, but also provided an occasion to improve the structural stability and the durability of the work. In addition to major work completed on the glass base, CSMO's treatment also included the creation of a more easily accessible and secure anchoring system for the brass elements, an upgrade of the integrated but long defunct lighting system, and an improvement of the artwork's drainage.

As conservators, we look at how our buildings and public artworks are constructed - not in terms of double-paned windows and R-values, but public safety, artwork security and finding a balance between public access and preservation. The fall of ice from the cornice of the museum recalls the fateful snowball thrown by Percy Boyd Staunton in the iconic Canadian novel Fifth Business, by Robertson Davies. As the effects of that snowball reverberate throughout the remainder of the book, so did the impact of the ice: though devastating to the sculpture, it set in motion the type of discussion and conservation treatment needed to preserve this emblematic Canadian artwork for decades to come.

The Rescue and Conservation of the Lost Shul Mural

Richard L. Kerschner, Principal, Kerschner Museum Conservation Services; Constance S. Silver, Conservator, Conservation of Cultural Property and Historic Preservation

In the 1890s, Chai Adam Synagogue, a characteristic shetl (Jewish village) wood-framed structure was built in Burlington, Vermont. In 1910 a Jewish Lithuanian artist, Ben-Zion Black, painted a mural high on the tripartite wall of the sanctuary apse. His exuberant trompe l'oeil painting was derived from a long tradition of Jewish synagogue decoration in Lithuania. Black's mural would be significant on its own merit, as an unusual example of immigrant art. However, it now has international importance as a rare surviving example of traditional Lithuanian synagogue art following the destruction of nearly every synagogue in Lithuania during World War II. In the 1940s, Chai Adam became a commercial building when the congregation moved to a new synagogue, Ohavi Zedek. In the early 1980s when the building was repurposed as apartments, the new owner agreed to implement emergency protection of the still-visible mural painting by isolating it behind a false wall in a second floor apartment. In 2012, the opportunity arose for the congregation to move the mural to Ohavi Zedek. Combined engineering and conservation studies confirmed that an innovative approach was needed to save the mural; the entire roof section of the sanctuary apse containing the mural had be cut away and moved as a single unit. On May 6, 2015, a pyramidal section of the sanctuary measuring 11 feet high, 20 feet wide, and 8 feet deep containing the mural supported by a steel superstructure, was safely relocated to Ohavi Zedek.

This paper will describe how an interdisciplinary team of conservators, conservation scientists, engineers, an architect, historians, and preservation carpenters worked together over

two years to address unexpected circumstances as the mural was consolidated, stabilized, protected, moved to Ohavi Zedek, and installed and restored in its new location. It will describe research carried out and the conservation treatments that were developed to address the mural's unusual conservation problems. Black executed his mural paintings on standard lath and lime plaster that existed in the synagogue in 1910. However, by 2012 the mural was in such poor condition that it was unlikely to survive the move. The painted surface had been reduced to a network of curled, fragile and detached flakes. Paint analyses identified the inherent weaknesses of Black's technique as well as several confusing but important incongruities in his paints that indicate he was hand-mixing them on site. Following a program of analysis and testing, the plaster was strengthened from behind using the consolidant HCT, followed by reconstruction of the plaster keys. To ensure the mural's safety during the relocation process, a novel system of facings of Crepeline adhered with Acryloid B67, followed by cyclododecane reinforced with fiberglass micro-mesh, was applied to the mural. Foam-lined plywood panels were secured against the faced mural to provide uniform, rigid support during the move. The roof section of the apse containing the mural was surrounded by a permanent steel superstructure to minimize movement of the plaster and to allow safe suspension of the mural in its new location at Ohavi Zedek.

Red Flames, Silver Linings

Eric Wolin, Head of Collection Management, Peabody Essex Museum; Mimi Leveque, Conservator, Peabody Essex museum; Angela Breeden, Move Coordinator, Peabody Essex Museum

[This is a two part presentation] On a hot Saturday afternoon in August, 2009, a fire was started accidentally at the Ropes Mansion, an 18th century historic house owned by the Peabody Essex Museum (PEM) in Salem, Massachusetts. The fire threatened not only the structure but the accumulated possessions the Ropes family members had used and stored in the house over many generations. Many first responders, museum staff and contractors were mobilized to immediately respond to the fire. In the first of a two-part presentation, PEM's response on the day of the fire will be examined, its preparedness scrutinized, the many challenges and strokes of luck catalogued. The second presentation will detail the complexities of recovering from the fire, from the immediate triage to the long term treatments, necessitating a conservation project to be undertaken by a range of specialists. The scope of conservation work ultimately grew to encompass the entire contents of the house - nearly 1,000 objects - as a new interpretation strategy for the house was developed. As the house was reinstalled, a team of collection specialists was mobilized to track, move and install everything from four-poster beds to tiny doll house spoons. Specific treatments will be reviewed in the context of the collaborative recovery effort that culminated in the May, 2015 re-opening of the Ropes Mansion to the public. Ultimately, the immediate response to respond to the fire and the lengthy process to recover from it helped teach PEM valuable lessons about disaster preparedness.

Issues and Challenges in Conservation of Living Monastic Heritage in the Trans-Himalayan Region of Ladakh, India

Satish C. Pandey, Assistant Professor of Art Conservation, National Museum Institute; Sonam Wangchok, Secretary, Himalayan Cultural Heritage Foundation; Noor Jahan, PhD Candidate in Art Conservation, National Museum Institute, New Delhi

Ladakh is a high-altitude region in the state of Jammu and Kashmir and is bound by the Karakoram Mountains in the north and the Himalayas in the south and is one of the most sparsely populated regions in India. The entire region of Ladakh is a cold desert with a barren landscape and very limited resources, yet it has been home to a thriving culture for more than a thousand years. Ladakh's vigorous cultural identity is closely related to its institution of 'Gompas' (temples and monasteries). These monasteries are vibrant centres of Buddhism in this trans-Himalayan region and are repositories of rich art and cultural heritage. Besides performing their basic function of propagation of religious and spiritual knowledge, these traditional institutions play a significant role in preserving the cultural heritage of the region. Having been an important crossroads of trans-Asian trade for centuries, Ladakh's unique cultural heritage reflects upon the profundity of cross-cultural exchanges between Tibetan culture, indigenous traditions and influence from the ancient Buddhist regions of Central Asia. The exquisite wall paintings, Thangka paintings (scroll paintings), manuscripts and other objects of art and craft comprise a very important part of Ladakh's cultural heritage. The monastic or village community have limited awareness about the value of their cultural heritage and therefore, there is a lack of proper maintenance and care. Rampant, unplanned modernisation and civic development in the recent times pose serious threat to art and cultural heritage in Ladakh. The monasteries were built mostly on hills, isolated from villages to avoid disturbances. However, in last 15-20 years all the monasteries were connected with motorable roads without considering the potential risks involved. In several monasteries traditional architecture have been destroyed and rebuilt or added using modern materials without considering the local climate and other consequences. Climate change is the most recent issue and heavy rains in last few years witnessed damages to wall paintings in the monasteries and village temples due to water seepages from the traditional flat roofs. In the recent times there have been several incidents of art conservators and architects visiting from foreign countries and practicing conservation on extremely valuable painting is ancient monasteries and there is no check on their expertise, experiences and qualifications. This paper aims to highlight some of the major issues and challenges in preservation of monastic heritage in Ladakh and proposes a framework for sustainable conservation interventions to save the invaluable heritage.

The Treatment and Installation of a Monumental Cedar Sculpture by Ursula von Rydingsvard

Emily Hamilton, Associate Objects Conservator, San Francisco Museum of Modern Art

Ursula von Rydingsvard (1942-) is best known for her large-scale, structurally complex sculptures made from cedar beams, often displayed outdoors. These works change in dimension due to shifting environmental conditions, and may require supportive armatures and ongoing maintenance treatments to prevent pest and environmental damage. This presentation will address the treatment and installation of "Czara z Babelkami" (2006) at SFMOMA as part of the inaugural exhibition in the museum's renovated galleries. The treatment involved close collaboration with the artist's studio to flatten and stabilize the sections of the work in response to previous dimensional changes. A surface treatment and long-term maintenance plan involving the use of a biocide and wood sealant was also devised with the studio. This collaboration provided valuable insight into the construction of the work, parameters for acceptable changes, and a broader perspective of how this artist's work is treated in other settings. Given the high seismic activity in San Francisco, a structural armature was designed in partnership with an engineer to support the work in case of a seismic emergency. The armature was designed to stabilize the work while allowing flexibility for further dimensional changes in response to outdoor environmental conditions. Installation on a newly renovated 5th floor terrace space necessitated extensive planning to move the sections safely with a crane and forklift, serving as a case study of project planning in unknown spaces.

The Study of Boxwood Prayer Beads And Miniature Altars from the Thomson Collection at the Art Gallery of Ontario and the Metropolitan Museum of Art

Lisa Ellis, Conservator, Sculpture and Decorative Arts, Art Gallery of Ontario; Pete Dandridge, Conservator and Administrator, Metropolitan Museum of Art; Alexandra Suda, Curator of Sculpture and Decorative Arts and Chair, Print & Drawing Council, Art Gallery of Ontario; Barbara Drake Boehm, The Paul and Jill Ruddock Senior Curator, Department of Medieval Art and The Cloisters, Metropolitan Museum of Art; Elizabeth Moffatt, Senior Conservation Scientist (retired), Canadian Conservation Institute; Jennifer Poulin, Senior Conservation Scientist, Canadian Conservation Institute

The Thomson Collection of European Art at the Art Gallery of Ontario (AGO) and the Metropolitan Museum of Art (MMA) each holds an impressive number of early 16th century, miniature boxwood carvings known as prayer beads and miniature altars. These intricate objects have fascinated collectors and now museum visitors with their diminutive scale, intricacy and somewhat mysterious methods of construction. A technical research project exploring these objects is underway at the AGO and MMA: findings will be shared in an exhibition at the AGO, MMA and the Rijksmuseum. The study of carving techniques and strategies of joining tiny, interlocking pieces will help group the objects into clusters of makers and/or workshops and perhaps even determine a chronology of manufacture.

Conservators and curators at the AGO and MMA have profited from different institutional collection strategies and staff expertise for the benefit of the project. The AGO's investigation relies on micro-computed tomography (high-resolution X-ray tomography), a non-invasive tool which reveals the carvings' internal structures and features. Imaging software allows 3D virtual models to be created from the high resolution X-radiographic scans which can then be examined and manipulated in a so-called "virtual deconstruction." With the information provided by the micro CT scans of their objects, the MMA took the additional step of deconstructing their boxwood objects to the extent possible. With greater access to their interiors, specifics of tooling and fabrication could be documented microscopically, intrusive restorations reduced, broken elements re-adhered, and accumulated dirt and insect casings reduced. The AGO has also embarked on an ambitious program to photograph the entire opus of prayer beads and miniature altars extant internationally (about 130 objects) using high resolution, focus stacking software. This will allow the comparison of objects and examination of detail impossible to date with the constraints of traditional photography, which was only able to produce hazy images of these tiny works.

To more thoroughly understand original manufacture and subsequent repairs and restorations, minute samples of the AGO works' adhesives, coatings and polychromy are being analysed at the Canadian Conservation Institute with Fourier transform infrared spectroscopy (FTIR); scanning electron microscopy-energy dispersive spectrometry (SEM-EDS); pyrolysis gas-chromatography-mass spectrometry (Py-GC-MS); and with a Bruker Senterra dispersive Raman microscope. Similar analytical work is being undertaken at the MMA. The employment of new technologies such as micro CT scanning, and focus stacking software along with the analytical work carried out at CCI and MMA, is providing previously inconceivable access to the prayer beads and miniature altars. The resulting data, including high quality images and previously hidden construction details, will allow conservators to posit credible theories about makers and chronologies of manufacture. The collaboration between institutions is yielding greater results than would otherwise be possible: there is access to a greater number of works for research purposes as well as the benefit of a collegial environment in which to share findings and deliberate their meaning.

Decoys X-rayed: What volume rad tomography and computed tomography contribute technical study

Nancie Ravenel, Objects Conservator, Shelburne Museum

This paper will examine some of the issues of adapting medical radiography to the examination of wooden artifacts, and explore and compare the usefulness of two three-dimensional radiological techniques, volume rad tomography and computed tomography (CT), for revealing tool marks and marks within joints on wild fowl decoys in Shelburne Museum's collection. While digital radiography equipment has become more affordable to museums, the price tag still is out of reach for smaller labs. The conservators at Shelburne Museum turn to the radiological technologists at the University of Vermont Medical Center Hospital(UVMMC) to assist with non-destructive examination of composite objects and paintings. Because of their size, decoys are well suited for transport from the museum to the hospital for study. At UVMMC, the equipment the technologists use to take standard radiographs for the conservators also can be used for volume rad tomography, rendering the technique more accessible and convenient than CT which requires separate scheduling. The advantages and disadvantages of each technique will be explored.

The Aftermath of Mends: Removing Historic Fabric Tape from Tlingit Basketry

Caitlin Mahony, Andrew W. Mellon Fellow in Objects Conservation, National Museum of the American Indian; Teri Rofkar, Weaver

Disasters strike items of cultural heritage in many forms. Though natural and human disasters cause large-scale destruction in a matter of minutes, the slow deterioration of our collections by misguided interventions can also bring damage of notable impact to institutions. A campaign of undocumented museum mending in the early 20th century left in its wake wide-spread instability for 130 Tlingit spruce root baskets in the collection of the National Museum of the American Indian. The repairs are over-sized strips of linen fabric tape attached with excessive amounts of hide glue or cellulose nitrate, covered with carelessly applied and chromatically unmatched lead-based paints. These well-intended but unsuitable interventions took the existing damage of minor rips, tears, and losses and escalated it in magnitude to include warped structures, areas of embrittlement, and visually distracting repair material that obscure the structure and inhibit exhibition and scholarship. To the Tlingit community, these baskets are surviving examples of an endangered art form. Furthermore, it is not only the survival of the baskets but access to them that is integral.

Guided by modern conservation and the expertise of Dr. Teri Rofkar, a Tlingit master weaver, we have begun a two-year project to reconcile the damage. We are investigating the optimal removal method of these mends and designing an appropriate treatment for the baskets which will reinstate their integrity, function, and potential for use for the Tlingit community and the museum.

Encountering the Unexpected in Southeast Asian Lacquer: Treating the Doris Duke Collection at the Walters Art Museum

Stephanie Hulman, Assistant Conservator, The Walters Art Museum; Meg Loew Craft, Terry Drayman-Weisser Head of Objects Conservation, The Walters Art Museum; Dr. Glenn Gates, Conservation Scientist, The Walters Art Museum; Michael R. Schilling, Senior Scientist and Head of Materials Conservation Group, The Getty Conservation Institute; Herant Khanjian, Assistant Scientist, The Getty Conservation Institute

In 2002, the Walters Art Museum received a gift of 153 objects of Southeast Asian Art from the Doris Duke Charitable Foundation. Many of the objects originated from Thailand and Burma (Myanmar) and were created in the 19th and 20th centuries. In 2014, the Conservation Division embarked on a three-year grant from the Institute of Museum and Library Services to treat sixteen of the objects that were previously identified as conservation priorities. These objects exhibited varying degrees of deterioration due to age, flood damage, and prior intervention. Many of the lacquered and gilded surfaces were actively flaking, and a majority of the objects were covered in an unusual sticky brown coating. Prior to removal, the coating was identified as modern due to the inclusion of a synthetic plasticizer. Additional information was collected about the decorative techniques that were used to create the surfaces through cross-section microscopy, XRF, FTIR, and Py-GC/MS. There were also questions regarding the visual reintegration of loss and how much inpainting was appropriate. Research travel to Thailand and Burma helped to address those questions in conjunction with input from museum professionals in the region.

Due to space constraints related to the large size of many of the objects, much of the treatment work was completed in view of the public in an open conservation lab. Over the course of the grant period, over 5,000 museum visitors were able to speak directly with conservators and see many of the objects during treatment. While furthering the strong history of public outreach at the Walters, the open conservation lab also created unique challenges for conservators in terms of materials and working methods which in turn shaped the treatment protocols. Once the initial analysis was complete and the treatment work began, it was readily apparent that Southeast Asian lacquer behaves differently than East Asian lacquer. The largest issues were encountered with consolidation and cleaning. For those objects that required consolidation, polar solvents such as ethanol and acetone distorted the lacquer, which limited the consolidant options. Lascaux P550-40TB (butyl methacrylate resin) was selected in some instances because it could be dissolved in solvents like mineral spirits and xylene. Additionally, the extreme

lifting of the flakes and the inability to move the objects into horizontal positions necessitated the use of cast sheets of adhesive that could be reactivated with solvents once in place. Removal of the sticky surface coating was possible with a water gel on some of the gilded lacquer objects, which was advantageous because so many surfaces were extremely solvent sensitive and the work was being completed in the public. In some instances, polar solvents were safe to use and removed the coating quickly without the need to clear the surface of gel residues. It is hoped that the information gained from this project will be a catalyst for future research and study regarding the treatment of Southeast Asian lacquered objects.

A New Understanding of the Aging Characteristics of Asian Lacquer

Marianne Webb, Senior Conservator, Webb Conservation Services

Recent studies at the Getty Conservation Institute have demonstrated, that Asian lacquer coatings are not simply the processed tree sap of urushi, thitsi or laccol but contain many other ingredients from common linseed oil to the unusual tofu. This study looks at how these additives are affecting the physical behavior and the aging characteristic of lacquer objects. Eleven samples boards were made that represented five different formulas based on laccol and six based on urushi. The samples contained transparent lacquers, some with oil added and other with pigments as well. Similar ground layers were used for all the samples so the characteristics of the surface layers could be compared. The Atlas weatherometer with a water cooled xenon arc lamp was chosen for the artificial aging of the samples boards. A Sodium Borosilicate glass inner filter and Soda Lime glass with a CIRA coating outer filter were used to replicate the spectra of natural light through window glass. Following light aging the sample boards were exposed to four cycles of changing relative humidity consisting of 1 week at 22% RH followed by one week at 80%. After artificial aging, the physical characteristics were compared by four methods of assessment that conservators have previously used on Asian lacquer: measurement of gloss, measurement of surface pH, a comparison of micro cracking using a scanning electron microscope and observation of auto-fluorescence. In all methods of evaluating the surface the initial lacquer formulas made a difference in the results and patterns of behavior are beginning to emerge. Conservators have used low pH measurements to evaluate the severity of surface degradation; however, when the 11 different Asian lacquer formulas were compared the transparent lacquers consistently measured lower that any samples containing oil or pigments. Although they had the lowest level of pH they retained the highest gloss. Gloss varied according to formula with greatest loss occurring on the sample colored by iron oxide. Under ultraviolet light the transparent lacquers showed more intense auto-fluorescence that those with oils or pigments with laccol being brighter than urushi. Micro-cracking after exposure to RH cycling occurred on most samples, however, many different patterns occurred. Transparent urushi had the least micro cracking which is consistent with the gloss measurements. Asian lacquer can longer be considered a single type of coating. It must be looked at more like a painting where variations in the medium, additives and pigments differ according to time, place and the individual artist.

Photography, Continuity and Change: Impact on the Conservation Field

Bertrand Lavédrine, Director, Centre de recherche sur la conservation

View from afar, the history of photography seems to be a long quiet river (to paraphrase the title of a French movie from the 1980s). Technically, each decade and each century has brought its tribute of innovations and discoveries through a linear evolution process. Like in the 19th and 20th centuries, we are still producing photographs with our cameras, and trying to keep them. It is true that photography today inherits from all the technical and artistic contributions from the past. However, the introduction of digital technologies has created discontinuities that are not always clearly tangible. The first one is the use, for a sake of convenience, of the traditional terminology such as «photograph» for naming digital images. This may create the feeling that we are still in the same domain, however, technically, we have moved in another dimension that has impacted our private, public, and professional areas. This paper will address, through a few examples, some changes that digital imaging has induced on the way we are assessing or preserving images and on the scientific researches in the conservation field.

Analysis of Historical Tintype Plates: Materials, methods, and manufacturers

Corina E. Rogge, Andrew W. Mellon Research Scientist, The Museum of Fine Arts, Houston

The tintype, a wet collodion photograph on a japanned metal support, became the most popular photographic technique in mid-19th century United States of America due to its durability, low cost, and the societal demands of the American civil war. Tintype plates consisting of a metal sheet with a protective varnish on the verso and the colored japanning layer on the recto were commercially available: at least 10 manufacturers are represented in trade advertisements of the time, and some offered plates with differently colored japanning layers (i.e. chocolate or black) or with different surface textures (glossy or eggshell). Despite the plenitude of manufacturers, and the production of millions of these cultural heritage objects, there is a dearth of information regarding what materials were actually used to create tintype plates. Two patents dating from 1856, the natal year of the process, list iron as the support material, and linseed oil, Japan varnish and colorants such as lamp-black, umber and asphaltum, as the constituents of the japanning layer. A third patent dating from 1870 cites the use of linseed oil and India red. However, japanning of tinware and leather was common and contemporary literature cites the use of shellac and other resins instead of (or in addition to) linseed oil, and so in an effort to maximize profit manufacturers may have used materials other than those cited in the patents. As part of an ongoing, comprehensive study on the material nature of tintypes, the metal supports and japanning layers of a study collection of 226 tintypes were analyzed by pyrolysis gas-chromatography (py-GC-MS), X-ray fluorescence spectroscopy (XRF), and microscopy. The predominant component of the japanning layers is drying oil, although some japanning layers also contain Pinaceae resin or shellac (64% and 3.5% of the collection, respectively). The primary material identified in the metal support is iron, although 22% of the collection also contain manganese. Dispersed sample microscopy revealed that the most common colorants in the japanning layer are iron oxide species and carbonaceous pigments, while py-GC-MS revealed only a limited use of asphaltum. The iron in the japanning layer may also have helped serve as a drier, as may the manganese and lead detected by XRF in 8% and 5% of the collection, respectively. Microscopy and cross-section analysis revealed that some japanning layers contain only a single homogenous layer, while others have been built up from multiple coats of material, with the lowest layer being the most highly pigmented. This densely pigmented layer likely corresponds to the 'black face coat' described in the sole historical essay describing plate manufacture. This first comprehensive analysis of tintype plates shows that the majority of plates differ from the patent literature in terms of the organic binders utilized. These results also reveal that the plate manufacturing process evolved through time and that different manufacturers used different formulations of materials to create their plates. Therefore, it may be possible to create 'profiles' for a given manufacturer--perhaps providing a date range for when a given plate was produced.

Investigation and Optimization of Electrochemical Treatment for Daguerreotypes

Elyse Canosa, Graduate Student, University of Arizona; Bill Wei, Senior Conservation Scientist, Rijksdienst voor het Cultureel Erfgoed

Due to their metallic nature, daguerreotype plates tarnish easily when exposed to atmosphere or other corrosive environments. The removal of such corrosion products has always been a controversial issue due to the irreversibility and potential damage inflicted by the treatment process. When performed using the proper technique and tools, electrochemical cleaning has been shown to remediate daguerreotype corrosion without causing damage to the object. This multi-year investigation explores in detail the effects of electrochemically treating daguerreotypes to better comprehend the physical, chemical, and aesthetic changes which occur during tarnish remediation. Such analysis includes understanding the extent to which tarnish is removed from the object, whether the microstructure and surface roughness are altered, and whether deposits are formed on the surface as the result of cleaning. Before characterizing the effects of treatment, a reliable and consistent electrochemical cleaning method was optimized on modern, custom-made daguerreotype coupons. These coupons were tarnished in controlled settings to produce

silver sulfide, then exposed to electrochemical treatment. Tests were executed to determine the most effective voltage for removing silver sulfide. Full characterization of the modern coupons was performed prior to corrosion, after corrosion, and after electrochemical remediation to provide full understanding of the treatment effects. Characterization techniques included scanning electron microscopy, x-ray diffraction, Raman spectroscopy, x-ray photoelectron spectroscopy, and confocal microscopy. The optimized process has also been tested on nineteenth century daguerreotypes, and the changes fully characterized and compared to those of modern samples. The results provide a much better understanding of the electrochemical treatment process on a chemical and microscopic level.

Characterizing RC Papers and Testing Adhesives Suitable for Their Hinging

Chris McGlinchey, Sally and Michael Gordon Conservation Scientist, The Museum of Modern Art; Roberta Piantavigna, Andrew W. Mellon Fellow in Conservation of Photographs, The Museum of Modern Art; Lee Ann Daffner, Andrew W. Mellon Foundation Conservator of Photographs, The Museum of Modern Art

For more than two decades, starting in the 1960s when they were first introduced, resin coated (RC) photographs have had a variety of flaws affecting the long term preservation of the different components. Today however, this paper type has fewer defects and has become widespread, particularly with the development of RC type papers for digital printing. The acquisition and display of these prints is now well established in museums that collect and exhibit contemporary art, however there remains a need for their safe and effective mounting.

This research focusses on 8 name brand RC papers that are currently available in the US and one historic paper by Kodak from ca. 1978. ATR-FTIR data was collected from the recto using both diamond and germanium crystals to sample the coating at different depths. Results indicate the historic paper is coated with unmodified polyethylene while the modern papers range from the same non-polar polyethylene resin to more polar surfaces, likely via surface oxidization. A polar surface is intentional and designed primarily to improve the wetting and bonding of ink onto the surface but will also influence a tape's ability to adhere. In this regard, tapes are being studied for shear and peel strength using conditions that approximate the load of the largest prints that might be exhibited. The shear mode findings are good for most of the adhesives tested, including wheat starch paste and methyl cellulose, but in peel mode - the Achilles' heel for thermoplastic adhesives - tapes fail more rapidly or show signs of creep. This suggests that if the latter mode can be avoided in the hinge design, adhesives that are more easily reversible on demand could be utilized for any of the papers tested. In addition to ATR-FTIR studies, characterization of versos by tactile feel, optical surface roughness, and simplified aqueous contact angle measurements will be discussed in the context of adhesion.

Identification of Chromogenic Colour Photographic Prints Brand by Spectral and Statistical Analysis

Tournié, Engineer, Centre de Recherche sur la Conservation - Museum National d'histoire Naturelle; Carré, Professor, XLIM CNRS; Christine Andraud, Professor, CRC MNHN; Boust, Engineer, Centre de Recherche et de Restauration des Musées de France; Bertrand Lavédrine, Director, Centre de recherche sur la conservation

Recent scientific studies have been devoted to the identification and characterisation of monochrome photographic processes starting from the earliest time of the history of photography since they were the most significant part of the collections and the main source of questions. However since the turn of the century similar concerns addressed to color photographs that are increasing in the collections, especially question of brand identification. Actually, being able to identify a colour process, a brand or even a period of printing may inform us about the history of the artefact and also its sensitivity to the environment. It is well known that some brands and production times correspond to different thermal and light ageing behaviours. For instance some manufacturers have improved chromogenic colour prints stability in the 1980's. Identifying a print manufacturer may help to define an exhibition strategy by referring to existing - or future - stability data. The name of the manufacturer is often printed on the back of colour prints with sometimes the year of production, however date or names are sometimes lacking and many prints in museums are permanently mounted on a polymer or aluminium support without access to the information written on the back and no proper documentation neither.

The aim of this study is to investigate the possibility of distinguishing materials from various manufacturers and periods by comparing their spectral signatures using non-invasive fibre optical reflectance spectroscopy (FORS) in the near infrared range. First, spectra have been collected on a limited number of chromogenic colour photographs to create a database. Then we evaluated the rate of success in attributing a brand to a print by comparing it to known prints from the database by applying different statistical procedures.

Surface Roughness, Appearance, and Identification of AGFA-Gevaert Photograph Samples

Ms. Sanneke Stigter, Lecturer and researcher, University of Amsterdam; Dr. W. (Bill) Wei, Senior Conservation Scientist, Rijksdienst voor het Cultureel Erfgoed (Cultural Heritage Agency of the Netherlands)

The age of digital imaging is rapidly pushing traditional photographic methods into the background. Furthermore, the replacement of discolored analogue photographic prints has become museum display policy, as it is seen as a solution in conservation, and is sometimes promoted by artists. There is therefore an

urgent need for methods to characterize photographic materials while they are still available and/or in relatively good condition. Surface properties are some of the most important because they determine the appearance and perception of photographs as works of art These properties are also valuable for identification and authentication purposes. In particular, the roughness of the surface of a photograph determines the glossiness, but also affects the perception of color. Moreover, a surface's physical character situates the print in time.

The photographs materials collection developed by P. Messier, and associated raking light methods for surface texture characterization are a good first step in classifying and identifying photographic materials based on surface roughness. However, in many cases, more direct techniques for measuring surface roughness are required, especially when it comes to assessing the effects of surface treatments. These need to be related to the actual appearance and perception of the materials to allow for better identification, or assessing changes in appearance due to treatments or aging. Over the past 25 years, white-light or laser confocal profilometry has become a standard technique for measuring roughness in many branches of industry. Besides being a non-contact method, the technique measures roughness directly with a resolution down to tens of nanometers, much better than any current optical method. Roughness can be characterized by the calculation of industrial standard roughness values, for example, average roughness, Ra or root-mean-square roughness, Rq. 3D visualization techniques can be used to characterize changes in surface roughness due to treatments or, more generally, the identification of photograph types. Currently, a study is being conducted by the University of Amsterdam and the Cultural Heritage Agency of the Netherlands on the relationship between surface properties and the appearance of photographic materials. The surface roughness of samples from an Agfa-Gevaert photographic sample book (1972 or 1973) was measured using a NanoFocus μSurf confocal white light profilometer, with a spatial resolution of less than 1 micrometer and a height/roughness resolution of 60 nanometers. The results are being related to the perception of a number of conservators and other museum professionals who were asked to judge the appearance of the samples. The results of this research thus far have shown that, when identifying photographic materials or making judgments about their condition, it is important that one considers both the "objective" values of surface properties such as roughness in relation to time and possibilities of the photographic industry, and the "subjective" interpretation of the observer, influenced by interest, cultural background, and time.

(1) Testing a Model for Multi-Faceted Engagement and Maximized Efficiency for Collection Response Under Restricted Time

Nancy Odegaard, Conservator Professor, Arizona State Museum-University of Arizona; Marilen Pool, Project Conservator, Arizona State Museum-University of Arizona; Christina Biscula / Gina Watkinson, Conservation Scientist / Laboratory Coordinator, Arizona State Museum-University of Arizona; Elizabeth Burr, 3rd Year Graduate Conservation Intern (UCLA), Arizona State Museum-University of Arizona; Nicole Peters, 3rd Year Conservation, Arizona State Museum-University of Arizona

Over a three-week period in fall 2015, the Arizona State Museum Conservation Laboratory personnel developed and tested a response model for time sensitive conservation situations.

Over 50 ceramic vessels from the indigenous southwest region of the United States (both archaeological and ethnological) were assembled from the collections already awaiting conservation treatment in the lab. Since the 2000 designation as a Save America's Treasure, the Arizona State Museum Conservation lab has continued to focus on the needs of the SW ceramic collections of more than 20,000 vessels. The lab has advanced new analytical techniques and identification of indigenous repair materials, new calibration and identification methods for soluble salts and ceramic desalinization, and new procedures for reversal of failing restorations. We have also completed an extensive review of the conservation literature for the use of commercial adhesives and their use in the in the stabilization of ceramics and a relational study of the date that these products were developed and became available.

An educational opportunity was proposed after a surplus of vessels was amassed in the lab having a variety of conservation needs. The vessels included categories of incoming loans, new accessions, label issues, found-in-collection mystery items, an historic object collage, various residue research questions, and a few mishandling problems. A window of time in lab activity was scheduled so that a diverse range of human resource could work together and clear the lab of objects.

This created the perfect opportunity to develop response methods that included cultural and historical perspectives/concerns with inter-disciplinary expertise under a dedicated three-week time restriction. We were able to create, implement, and evaluate the model where the use of time, human expertise, and reflective efficiency of the activities was documented.

Activities included:

- Staging and inventorying the vessels in the response activity
- Identifying the treatment needs for each vessel and prioritizing work flow
- Assessing the needed supplies and equipment
- Developing a spread sheet for tracking
- Creating a tracking form for each vessel
- Confronting surprises Keeping track of time expenditures by people involved and tasks
- Synthesizing data
- Creating guidelines

This study will cover the successes, failures and educational experiences in undertaking this complicated task. We suggest that this method of organization could be applied to a broad range of intensive conservation projects and to disaster responses as well.

(2) Weathering the Unexpected: Lessons Learned in Keeping Seminole Cultural Property Safe

Marlene Gray, Conservator, Ah-Tah-Thi-Ki Seminole Museum

The Ah-Tah-Thi-Ki Museum (ATTK) is located on the Big Cypress Seminole Indian Reservation in the Florida Everglades. Owned by the Seminole Tribe of Florida, the Museum consists of both permanent and temporary exhibition spaces that feature artifacts related to Seminole history and culture. Beyond the Museum doors is a curatorial building with a fully functioning conservation lab and collections storage vaults, a Tribal Historic Preservation Office (THPO), a natural "museum" of the Everglades flora and fauna on a mile-long boardwalk, and a Living Village for Seminole artists to work and sell their crafts. Extreme weather, such as hurricanes, wildfires, tornadoes, and severe thunderstorms is nothing new to this region of the United States. That is why the Museum can never be too prepared for impending disaster! The ATTK Museum has endured these events, but not always without incident. 2005's Hurricane Wilma produced severe roof damage. High levels of humidity in the following years caused mold contamination on gallery support beams.

As a result, Museum and THPO staff take annual training in how to react to various disaster situations and protect the cultural property safeguarded here. Photographs and detailed maps of the gallery spaces are amassed as documentation of displays and a running record of any changes that may occur over time, both from changing exhibits and emergency situations. Individually designed mannequins, massive paintings, and loaned objects pose challenges in safely moving them through awkward spaces in and outside the Museum building to storage vaults. Emergency preparation is a significant component to fulfilling the Museum's mission of being the protective home for thousands of Seminole archival documents and artifacts. As a tribal institution on reservation land and the next major city at least an hour away, the ATTK Museum also faces the challenge of access to resources that other cultural institutions may take for granted. Planning and communication between the Department of Emergency Management and the Seminole Tribe community keeps Tribal Members and Tribal Department staff updated on impending weather threats. Advanced warning allows Museum and THPO staff to successfully prepare, relocate, and secure collection objects safely from Mother Nature's harshest spectacles. This poster will share the challenges faced and lessons learned from 2008's mold remediation and summer 2015's Museum ceiling painting projects. It will also explore the development of the best action plans for weather-proofing buildings and safely moving artifacts and gallery props to secure storage areas, while still providing the Tribal community with access to their cultural collections.

(3) From Table-top to Wading Pool: Designing Effective Emergency Training Exercises

Dyani Feige, Director of Preservation Services, Conservation Center for Art & Historic Artifacts; Laura Hortz Stanton, Executive Director, Conservation Center for Art & Historic Artifacts

Thoughtful preparation for an emergency or disaster is one of the most important steps a cultural institution can take to safeguard collections, but having a written disaster plan in place is only one

step in a comprehensive emergency preparedness program. Staff training is a vital component of emergency preparedness: in the event of an emergency or disaster, lack of appropriate training in coordinating a response team, evacuation procedures, and salvage methods for collections materials can complicate and delay effective action and could even be a risk to human safety as well as collections. This presentation will offer tips and tools for initiating emergency training that is custom-designed to the purpose and setting.

The Conservation Center for Art & Historic Artifacts (CCAHA) has guided cultural organizations in a range of different types of training sessions regarding emergency preparedness, response, and recovery. Workshops have varied in length, format (lecture-based, tabletop exercise, functional exercise, or a combination thereof), and intended audience (institution-specific, discipline-specific, or more broad in focus). The program developers and instructors have, through observations during workshops, written participant evaluations, and accounts gathered regarding various actual response and recovery efforts, gained evidence to effectively tailor format and content to be scalable and appropriate for different audiences and situations. CCAHA's emergency preparedness and response workshops have not only incorporated models from others in the conservation field, such as the Western States and Territories Preservation Assistance Service (WESTPAS), but the emergency management community as well. Training sessions introduce and use the framework of the Incident Command System (ICS), teaching participants the structure and language of first responders and others in the emergency community. By learning not only ICS but also additional FEMA terminology and emergency management protocols, conservators and other collections care professionals are provided information and skills to more easily liaise with emergency management agencies and outside vendors. This presentation will also discuss how different models for emergency preparedness and response training can be adapted by conservators and collections care staff in a variety of professional settings. Individuals in private practice can pursue similar strategies with the various institutions with which they work, staff from larger institutions can learn tips for implementing cross-departmental training and collaboration, and staff from small to mid-sized institutions can explore opportunities for adopting a scaled approach to training at their institutions and/or in collaboration with other institutions.

(4) Preserving Culture Heritage: High Value and Affordable Tools

Laila Hussein Moustafa, Assistant Prof. Middle East and North Africa Studies, University of Illinois Urbana-Champaign

In recent years, conflicts around the world have expanded in such a way to seriously endanger cultural heritage collections especially in the Middle East and Africa countries. In many cases, whole collections have been lost or displaced, and sometimes prevent scholars from reaching to the primary materials to conduct their research. Countries with a long and old history particularly affected in the last few years include Iraq, Syria, Yemen, Mali, Sudan, Tunisia, and Egypt, among others. Although these situations are not new to the Middle East and Africa, technological developments have shown encouraging results for the preservation of materials before, and after disaster takes place. Many scholars have proposed digitization to preempt the potential loss of important collections that face or can face disaster in time of war or conflict, however, there are always challenging for such projects such as training, official government collaboration and custodianship. Furthermore, digitization would not solve the problem of access to politically-restricted or censored collections. These points requested collaboration between scholars, librarians, donors and government institutes. Without the collaboration of all these groups the respond to any challenge posed by reduced access for researchers and their fieldwork, as well as to threats to cultural heritage collections in the Middle East and Africa. This paper will focus on the use of open source to preserve culture heritage. The internet crowds with software that can be used preserve high value in a cheap way. For example, everyone today own advice that can help in taking picture of an object or a document, free storage software can give a good [s]ecure space to storage matters. I also will advocate in this paper in how to increase the public participation in this process and train them in a simple way to process and descriptive the item they are interested in preserving it. Open access can help fulfill the goal of protecting cultural heritage items. Of course, open access is not [T]he solutions and it has negative side and positive side. I will try to show the positive and negative of open access and who should partner in such a project and what education each group needs Preserving culture heritage materials in collaboration among librarians, scholars, researchers, and the public can help in fulfill the goal of preserving and making culture heritage available to all. My hope is to bring different community together to cooperate and establish affordable solution to non-replaceable heritage items.

(5) Collaborations for Safety: A Team Approach to Writing Emergency Procedures Plans

Karen Nourse Reed, Assistant Professor and Education Librarian, Middle Tennessee State University

Emergency procedures plans are the sort of policy that often gets overlooked in favor of more pressing day-to-day concerns; the problem, however, is that emergencies do not wait for good policies to be in place before they strike. This presentation will help put viewers in a proactive mindset by showing that this work does not need to be overwhelming when approached as a team. Learn from the experiences of one mid-sized academic library in Tennessee which recently completed a full revision of its emergency procedures plan. What was once a very basic policy became explicit, comprehensive, and accessible to library employees. Although we are very pleased with the results, what is perhaps equally important is how we got there. A committee, representing a broad cross-section of library employees, was tasked with revising the old policy. This committee partnered with campus units who had some commonality in function and purpose. The wealth of collaboration in this process produced a new policy which captures the contemporary security concerns of American university campuses as well as natural disaster preparations. Although the focus of this project was on safeguarding library employees rather than the library collection, the steps presented could be applied to a variety of preparedness plans.

This presentation will emphasize the preparedness phase: how does one begin to write or revise an emergency procedures policy? Who should help with this activity, and how does one recruit

committee members? What should be included in the policy? What resources are available to help craft the policy? How does an organization roll out the new emergency procedures to employees?

(6) Updating Our Emergency Plan at Aanischaaukamikw Cree Cultural Institute

Fiona Hernandez, Conservator, Aanischaaukamikw Cree Cultural Institute, Harold Bosum, Facilities Manager, Aanischaaukamikw Cree Cultural Institute

The Aanischaaukamikw Cree Cultural institute (ACCI) is a First Nations museum, archive, library and teaching centre located in Oujé-Bougoumou, Quebec, dedicated to preserving and passing on James Bay Cree traditional knowledge to future generations. This unique institute faced a very common problem: a forgotten emergency plan collecting dust on the shelf, and faded memories of salvage drills that did not address the most pressing risks to the institution or the safety of the people. Added to this was a relative lack of data of specific risks in our community and lack of emergency preparedness expertise among staff. We were faced with the question, what should we be worried about? Caribou herds trampling the museum? A uranium spill that makes the whole terrain unlivable? A fire, while the community experiences the common occurrence of loss of water pressure and telephone communication breakdown? Who can we go to for help? And how do we engage our staff to care?

This poster outlines ACCI's emergency planning team's process and outcomes in updating our plan to create a working document that engages with staff and the community for disaster preparedness. The team approached emergency planning as a holistic process, identifying two areas that required work: risk assessment and the human side of the plan. First, we completed a comprehensive risk assessment to identify and quantify the specific challenges of the institution, taking into account our remote location, community infrastructural shortcomings, unique building and mixed collection. Second, the team developed the human side of the emergency plan, focusing on regular meetings, step by step planning, building awareness among staff and building community relationships. The team used templates available online and altered them to fit our situation, as well as coming up with specific drills and measures based on our particular challenges. This case study presents ACCI's process of finding practical solutions to disaster scenarios in our community, reflecting on the successes and challenges of emergency preparedness planning in a remote northern Canadian First Nations museum context.

(7) Elements of 9/11 in Focus

Fenella France, Chief, Preservation Research and Testing Division, Library of Congress

The current "conflict" climate necessitates that we look to events of destruction and use these for positive sources of information to better guide and respond to events of both natural and man-made disasters. It is almost fifteen years since September 11, 2001. The events of 9/11 and the World Trade Center tragedy was in some ways a turning point where the recognition of an event could essentially become "immediate history" overnight. The impact of this event and the consequences to infrastructure, architecture, archives and the infinite personal loss taught much about how the range of personnel involved engage, and the need for effective communication. The recognition of key personnel at the New York, New Jersey Port Authority that certain objects should be retained was a decision that was critical to the creation of the World Trade Center Archive, later becoming part of the museum display. For conservation efforts, the education of non-conservation trained partners, volunteers and support crews in understanding how to interact with items of potential historical significance was a critical component, given the size, volume and range of material types. Further challenges associated with the dimensional component and the interaction between inherent material and environmental degradation required a structured pragmatic approach, ensuring engagement of all partners for decision making, even for something as simple as moving artifacts from being outside in a salt and high humidity environment, to moving them into a hangar at JFK airport. Curatorial decisions were also challenging, ranging from people wanting artifacts to just degrade naturally without any preservation, through to what ultimately prevailed; preserving all materials while retaining the information, structure and soiling from the event. Protecting cultural property and being able to respond and react immediately and effectively is a skill being honed and developed and we must utilize the knowledge gained from the past to assure proactive response to potential future events. In the continuum of heritage disasters that are both man-made and natural, from the destruction in WWI and WWII of the Leuven Library, the Florence Flood, we can also use this information to better meet the needs of everyday challenges with a focused and pragmatic approach, and integrating the knowledge we have learned from these past challenges to our world heritage.

(8) Fools Rush In: Creating a Disaster Salvage Lab

Elizabeth Stone, Assistant Conservator, University of Iowa Libraries, Caitlin Moore, Conservation Technician, Olin Library Cornell University

Immediately following the Cedar River flood in 2008, the University of Iowa Libraries adapted its Conservation Lab to become a flood recovery lab for the National Czech & Slovak Museum & Library, African American Museum of Iowa, and the Johnson County Historical Society Museum. Staff immediately began salvage work while the flood waters crested. Treatment continued through 2015.

A decision to turn a conservation lab into a disaster recovery lab should not be taken lightly. But since the University of Iowa Libraries Conservation Lab was less than an hour away from the Cedar Rapids museums and had experienced staff, providing immediate disaster recovery services proved to be essential to saving cultural history. Varied material from the three institutions was damaged and needed both assessment and treatment. The Conservation staff, while eager to respond, faced several obstacles including: training specific to salvage operations, contract negotiations with the institutions, establishing workflows and treatment strategies for flooded items, procuring space for storage, and creating inventories. There was

material outside of staff expertise, including woven baskets, wooden objects, metal objects, and phonographic materials. To solve this the Preservation Department contracted out some items to other conservators and labs, but also brought in outside conservators to train staff for salvage of materials with which there was little familiarity. New and unanticipated problems prompted staff members to utilize resources on hand to develop techniques and strategies. As the project gained momentum, batch treatment became critical to the efficacy of salvaging the collections. Student workers and volunteers helped to keep costs low and insured timely completion. In addition to their direct contribution of labor, the good will and community feeling created by using volunteers cannot be overstated. The buzz that a good volunteer experience leads to an increased public understanding of the role an organization plays in its community.

(9) Collaboration as Preparation: Keeping Interest and Commitment to the Cycle of Disaster Preparedness

Elizabeth DeBold, Curatorial Assistant, Folger Shakespeare Library, Renate Mesmer, Eric Weinmann Head of Conservation, Folger Shakespeare Library, Heather Wolfe, Curator of Manuscripts, Folger Shakespeare Library

Preparing for disasters means more than simply assembling materials for recovery, or even writing down a step-by-step plan. It involves constant practice, evaluation and re-evaluation, and a commitment from stakeholders across the entire breadth of an organization. At the Folger Shakespeare Library, we have spent the last year completely re-evaluating and reforming our commitment to disaster preparedness. Following several on-site, localized disasters, it became clear that commitment and collaboration from all staff members to both simple and complex disaster preparations is vital to our future success in facing situations large or small. Achieving mental engagement and buy-in from librarians, catalogers, curators, circulation staff, digital imaging staff, the facilities team, and security team is both crucial and difficult to maintain longterm when other, more pressing daily issues consistently assert themselves. Preparedness for disaster must, however, become a key part of every staff member's daily work. The Folger's Collections Disaster Preparedness Committee, comprising key members of our Security team, Facilities team, Reference team, Acquisitions team, Conservation team, and Curatorial staff is central to this goal. This poster will provide an examination of our development of a library-wide collaborative network of staff trained not only in the Folger's current plans and procedures and basic materials recovery techniques, but in decision making, team building, spatial awareness, and confidence in their abilities through workshops, presentations, the use of outside resources, and even fun, drill-style activities. The poster will also show a step-by-step progression to the simple but effective way the presenter and co-authors, along with the Collections Disaster Preparedness Committee, have written a comprehensive plan and other supportive documentation to back up training and preparedness at our library.

(10) Aden's Ancient Cisterns: Historic Preservation, Water Management and Disaster Avoidance

Edith A. Dunn, PhD, Conservator/Historic Preservation Specialist

The city of Aden, Yemen is a natural harbor on the Red Sea. The absence of a fresh water supply has been an issue throughout the city's long history. Historically, water was supplied by wells and stone-lined pools that collected surface run-off from Monsoon rains. A condition assessment of Aden's water collection system for the purposes of historic preservation was performed in 2007.

Although modified many times over the centuries, the cisterns in Aden have existed for at least 1500 years. Their creation was a prerequisite for habitation. The archaeological remains of the cisterns were reconstituted by the British in the nineteenth century. Today, the water collection system is still an integral part of the city's urban fabric and cultural heritage. The historic cisterns connect the watershed at the top of Jebel Shamsan to the city below via a series of canals and channels.

Problems regarding the water system's conservation and historic integrity cannot be separated from broader issues of water management and urban planning. An interdisciplinary approach was employed for analysis of the site in order to understand the factors affecting its deterioration. The site was considered from historical, archaeological, structural, geological, and hydro-logical contexts. This approach underscored the importance of the landscape to the system's preservation. The cisterns are threatened not only by deterioration of their masonry components, but also by destruction of the water shed and encroaching unregulated development near the canal.

The current deterioration of the water collection system is having dire consequences. Retention of surface water has diminished due to the deterioration of the cisterns. The failure to retain and manage surface run off also prevents regulation of the annual Monsoon rains. Floods in Aden have destroyed property and resulted in the loss of human life. Flooding also threatens adjacent archaeological remains and historic fabric of the cisterns.

The mismanagement of the water collection system has encouraged the spread of water borne disease. Sewage has been pumped into the canals which carry the water into the city below. The sewage lines that now empty into the canals are both a negative impact on the historic fabric, and a public health hazard. The water from the Aden cisterns is not considered potable by modern standards. Nevertheless, it is a potential resource in a region with chronic water shortages. Given the critical shortages, this water could be slightly cleaned up, and used as so called "gray" water for agricultural purposes. This would ease the burden on other potable water sources. The decline of the Aden water collection system currently continues. Water shortages have intensified as a result of regional conflict and continued deterioration of the masonry.

Reversing the water situation in Aden should include sound management and an integrated approach to landscape and structural elements. Good water management policies and retention of the historic integrity of the system are not mutually exclusive. In fact, the preservation of the cisterns and sound water management are complimentary.

(11) Response to the Burning of the Scientific Library in Cairo, Egypt

Cheryl Porter, Director, Montefiascone Project

The burning of the Scientific Library in December 2011 was an emotional event for all Egyptians who value their cultural heritage. Graphic images showing the library on fire and burned books were printed in the newspapers and shown on TV. What is less known is the amazing rescue efforts made by the conservators and volunteers, who came in their hundreds and worked in difficult conditions and for long hours. Many conservators from the Dar al-Kutub (National Library), as well as security and other support staff worked late into the night. Many students and their professors, as well as conservators from other institutions and hundreds of others came to the doors of the Dar al-Kutub offering help to do whatever needed to be done. Using the technology of "vacuum packing" the teams were able to dry out and salvage many hundreds (and maybe thousands) of books and papers. Because it is simple and cheap to operate, this technology has worked very well in a number of emergency situations. The paper will examine and explain how the technology was used in Prague, in Montefiascone, in the Fitzwilliam Museum in Cambridge (UK) and after the tsunami in Japan. This paper will examine the effectiveness of the technology and assess its usefulness. The paper will also describe the use of social media (Twitter and Facebook) in alerting and mobilising volunteers, as well as gathering material and equipment donations for the salvage work.

(12) Salvage-Course Integrated Into the Training for Conservators at the University of Applied Arts Hearc Neuchâtel, Switzerland

Nathalie Ducatel, Coordinatrice de la formation continue / Continuing Education Coordinator, Haute école de Conservation-restauration Arc; Eléonore Kissel, Responsable du pôle Conservation et Restauration, Musée du quai Branly; Karin von Lerber, Textile Conservator and Consultant in Preventive Conservation, Prevart GmbH

In 2005 large areas of Switzerland suffered flooding after long and severe rainfalls. Several museums were affected and while all rescue work was successful, a potential for improvement was noted. Following these events the University of Applied Arts, Department of Objects Conservation of the Swiss Conservation-Restoration Campus, reserved a time slot to introduce a practical three weeks module about salvage operations for cultural heritage. Since 2008, this course has developed into a sound, didactically structured and exciting experience for all partners involved: students, teachers, civil service agents, fire fighters and curators. The founding principle of this course is role playing. The students are welcomed by two archives and museum curators, who introduce them to "their" collection (consisting of donated or flea-market objects and documents). On the pretext that the collection has to temporarily leave the premises for a refurbishment of the building, the students get acquainted with the differences in inventory practices for museum collections and archival holdings. They inventory, number and label, establish a transportation list and pack the collection. The students then take a two-day introductory course on disaster recovery. It includes various presentations such as a photographic introduction to disasters, graphic animations regarding on-site management and the description of the Swiss Civil Security chain of command. Safety issues are presented by a teacher from the Health Department, along with the demonstration of individual protection equipment. Mostly however, that part of the module is based on simulation training techniques which includes group exercises on setting up an adequate organization for salvage, experimenting efficient communication techniques or reflecting on pairs of objects shown before after disasters. During that time, the objects have been transported to the Fire Brigade training site, in order to be either set on fire or flooded – on a two years rotation. As the students are the only persons beside the curators to know the collection, the firemen call them on site where they are given the responsibility to rescue, stabilize, document, re-inventory and if necessary deaccession the collection, following ICOM Guidelines. All procedures are implemented in permanent coordination with fire fighters, civil security representatives and the collection's curators. The local press is involved, enhancing the real-life feeling of this highly practical training. After five intense days of rescue operations, the students follow a two days laboratory course about mold. They then have one week at their disposal to prepare their documentation which includes a timeline, a description of the organization that prevailed, a critical review of actions taken and statistics on the salvaged collection, the time spent on various operations and the costs involved. All training partners convene for a final presentation by the students, which then hand the lead back over to the curators. The paper will develop on the different stages of the course, some of the teaching material as well as on the interaction with and participation of the professional first and second responders.

(13) Preventive Conservation for Seismic Risk

Randy Silverman, Head of Preservation, University of Utah Marriott Library

For cultural institutions located in seismic hazard zones, earthquakes are a certainty; it is only a matter of when. Mitigation strategies for glass plate negatives and other fragile library media (e.g., lantern slides; papyrus housed in glass sandwich mounts; and early sound recordings including acetate transcription discs) can dramatically reduce vulnerability, especially during minor seismic events. Acknowledging the high probability of collection damage for fragile media difficult or impossible to repair, affordable technical options for preventing breakage are essential.

This paper addresses a philosophy for developing seismically resistant storage conditions for fragile collections based on principles applied to shipping eggs. Concepts include: 1) separating individual objects with padding to prevent item-to-item contact when ground shaking occurs; 2) packing padded objects snuggly within a box to prevent rattling; 3) surrounding each box with padding so it 'floats' on the shelf, isolated from vibration and contact with other boxes; and 4) inhibiting box movement within the shelf to prevent storage containers from falling or being thrown to the floor. Two further recommendations—5) anchoring shelving to the floor so it sways without falling over, and 6) seismically reinforcing the building itself to prevent structural collapse—can ensure the collection successfully rides out a large-scale earthquake. Because these last two options are costly to implement, they may require phased implementation over time. Inexpensive models

are illustrated for implementing seismic stabilization strategies for glass plate negatives and lantern slides; papyrus housed in glass sandwich mounts; and acetate transcription discs. Additionally, an inexpensive prototype—the Seismic Shock Cord—is introduced. The Seismic Shock Cord effectively inhibits movement of boxed three-dimensional objects stored on standard library shelving, and is easily removed to facilitate access. Cumulatively, these techniques encourage preventive action for institutional collections exposed to seismic risk. Low cost, simple designs are emphasized to promote action, as a stitch in time assuredly saves nine.

(14) Biohazard Abatement: National Cathedral Vandalism

William B. Adair, Lead Conservator, Gold Leaf Studios, Inc.,

In July 2013, Gold Leaf Studios received a call from James Shepherd, Director of Preservation and Facilities at Washington National Cathedral. The Children's Chapel and Bethlehem Chapel had been vandalized with green paint mixed with human excrement. In consultation with Catherine Dewey, conservator for the National Park Service, and the Smithsonian Institution's Analytical Conservation Lab, it was determined that the green paint used in the vandalism was alkyd based. The key to successfully clean and decontaminate affected areas of the chapels and mitigate any lasting damage lay in responding as quickly as possible to the vandalism. The primary concern for the conservation team was the presence of unknown contaminants in the paint covering the affected areas. The team prepared an emergency biohazard response kit in anticipation of working with potential hazardous materials.

The treatment methodology for all affected surfaces was to first carefully remove the thickened wet paint with wood spatulas, disposing of the toxic waste in plastic bags. This was followed by cleaning the surfaces with cotton swabs saturated first with mineral spirits and then a mix of gel solvents. This treatment was most effective over the oil-gilded surfaces. Areas of thick fecal matter already beginning to dry were covered with a poultice of distilled water and non-ionic detergents before being removed with wooden spatulas. An antibacterial soap was used in the final cleaning to remove layers of acidic residue. The quarter-sawn oak paneling in the Bethlehem Chapel was unfinished with no protective varnish. As a result, the contaminants were able to seep into the wood and other techniques were employed to mitigate and contain the contaminants.

(15) The Identification of Natural Indian Yellow and Other Historic Late 19th Century Pigments From the Toulouse-Lautrec Estate in France

Aaron N. Shugar, Andrew W. Mellon Associate Professor of Conservation Science, Buffalo State, SUNY; Rebecca Ploeger, Assistant Professor of Conservation Science, Buffalo State, SUNY

Historic paint samples were sampled from Château du Bosc, the family home of Henri de Toulouse-Lautrec. The home is located in Aveyron, France, approximately one hour from Albi, Toulouse-Lautrec's birthplace. Due to his death at a young age, the Château was passed down to Toulouse-Latrec's cousin, and remains the home of a distant relative. The samples retrieved were collected from tin based tubes housed in wooden shipping boxes. In most cases, the tube labels are legible, and the paint distributors' names have been linked to contemporary artists of the time, such as Vincent van Gogh and Gustav Caillebotte. A range of scientific analyses, including PLM, XRF, μ-FTIR, py-GC-Ms and Raman Spectroscopy, were employed to fully characterize these pigments to study the paint media, fillers/extenders, pigments, and some degradation products. The samples range in colour from reds, greens, brown, blues and yellows.

Some of the interesting results will be featured here, including the discovery and characterization of natural Indian Yellow.

The wooden shipping boxes are believed to have been purchased by Henri de Toulouse-Lautrec's mother to encourage him to explore artistry as a career after he fractured both of his legs, which left him physically unable to participate in many physical activities. Stored in a dark attic, the paint tubes, some used, some not, have been untouched since that time. They offer a glimpse into the Toulouse-Latrec's early palette, and in a broader sense, the pigments and paints available to artists working in France at that time.

(16) Investigating the Story Beneath: the Examination and Treatment of Charles Baugniet's 'Washington's Birthday'

Erica Schuler, Samuel H. Kress Fellow in Paintings Conservation, Indianapolis Museum of Art

Understanding an artist's motive for altering an original concept may never be fully realized; however, the investigation into intent can prove to be an intriguing and rewarding challenge. Research and photographic examination of Charles Baugniet's "Washington's Birthday" revealed a complicated story beneath the painting's surface. Over the course of approximately seven years, Baugniet made extensive adjustments to simplify the design of his patriotic 19th century parlor scene but preserved the original concept of a centrally placed group of figures paying homage to a life size portrait of their beloved George Washington. For reasons unknown, the artist applied paint layer upon paint layer, altering colors, fashion, and decor until "Washington's Birthday" transformed into the painting that exists today. The painting's deteriorated appearance prompted a treatment campaign intended to improve the picture's overall aesthetic. Subtle variations in tone and brushwork were obscured by darkened and degraded coatings, and disruptive passages of traction crackle impeded visual continuity within the picture. To investigate structure and condition, the painting was documented through Reflectance Transformation Imaging (RTI), X-Radiography, and Infrared Reflectography (IRR), and surface coatings were characterized using Transmission Fourier Transform Infrared (FTIR) Spectroscopy. Once thorough testing was complete over all colors, appropriate cleaning systems and methods were devised to reduce the discolored varnish coatings.

The poster addresses the research, condition, and treatment of Charles Baugniet's "Washington's Birthday". While research is ongoing in the hope of better understanding the artist's motive(s) for altering his design, treatment proved successful in returning the painting to a condition suitable for exhibit and further research. Varnish reduction markedly improved the legibility of color and depth within the composition and selective inpainting returned visual continuity to the design overall.

(17) Chromolithography 1870-1930: The Identification of Commercial Colour Lithography Processes, Ink Modifications and Conservation Treatment

Erin Walker, Assistant Paper Conservator, Tate

The research summarised in this poster contextualises chromolithography in the commercial printing trade by the various methods of their production, and the composition of their inks to aid in their identification and preservation. Colour lithographic printing, commonly referred to as chromolithography, entered the commercial printing trade in the mid-nineteenth century. The rising demand for colour printing in the twentieth century resulted in more economic and efficient colour printing processes. These demands resulted in an array of new patents for ink formulations, printing papers and photomechanical productions.

There has been little published research found on the specification of these inks and their possible sensitivities during conservation treatments. This research aims to uncover many of the patents, formulas and recipes used in the manufacturing of lithographic inks of the late nineteenth and early twentieth centuries, with a specific focus on additives and modifiers used as driers, extenders, and reducers. Information was gathered from relevant patents, treatises, technical manuals, and other historical literature. An overview of published conservation case studies has been conducted to emphasise the necessity for understanding the media and technique which may ultimately lead to potential sensitivities. The possible sensitivities printing inks may exhibit during certain conservation treatments is summarised. A clearer understanding of the composition of colour lithographic printing inks will serve to inform conservation practice and help limit the risks associated with aqueous cleaning and other treatments.

(18) Technical Investigation and Reattribution of Tintoretto's Apollo and the Muses at the Indianapolis Museum of Art

Fiona Beckett, Clowes Conservator of Paintings, Indianapolis Museum of Art

Depicting mythological symbols of the liberal arts - the nine muses - along with a flying Apollo and Pegasus, the painting Apollo and the Muses at the Indianapolis Museum of Art (IMA) initially underwent technical analysis as part of an initiative to update the catalogue for the Clowes Collection. As the analysis progressed, the attribution of the painting was challenged. Originally thought to be painted by Domenico Tintoretto (son of renowned Venetian artist Jacopo Tintoretto) for the rounded smooth brushstrokes characteristic of his style, the underdrawing revealed a much different hand, that of swift expressive lines much more like his father Jacopo Tintoretto. The painting's history is well documented, and it was featured as an engraving in David Teniers the Younger's Theatrum Pictorium (Antwerp, 1660), recording the most admired Italian paintings belonging to the Archduke of Hapsburg, Leopold Wilhelm. In the 20th century, it was sold to the Clowes family. Previously on long-term loan, the painting was gifted to the IMA in 2014. Several variants of the muses by Tintoretto also exist, including a much larger version at the Royal Collection Trust, a fragment at the Rijksmuseum, and a Dresden version which was destroyed in the war. Of these, the Royal Collection Trust version bears a remarkable resemblance to that of the IMA.

Relatively small considering Tintoretto's preferences for large canvases, the IMA painting (55.0cm x 93.2cm) was thoroughly imaged, x-rayed, and analyzed with x-ray fluorescence. Additionally, cross sections were taken in several areas to analyze the paint and ground layers. Of particular interest was transmitted infrared imaging, which revealed numerous changes and adjustments in the underdrawing. The swift expressive brush marks accomplished in a fluid medium was a common feature in Jacopo Tintoretto's speedy painting technique and fitting to his Italian nickname Il Furioso. Elements in the composition appear to precede the Royal Collection Trust painting, and reveal that it is not a copy. One of Jacopo Tintoretto's studio habits included painting suspended and draped figurines to create new compositions, a habit that correlates well with the composition of Apollo and the Muses. Results to date indicate that the painting was most likely designed and sketched by the hand of Jacopo Tintoretto, and later finished by his studio hands (of which he had many) in preparation for a larger more finished painting, quite possibly the The Muses at the Royal Collection Trust. The upcoming catalogue entry will reflect this re-attribution and share the findings of the technical investigation, allowing the nine muses to inspire visitors as they once did Tintoretto.

(19) Determination of Binding Media in Easel Paintings: A Direct Analysis Method

Henry DePhillips, Professor of Chemistry Emeritus, Department of Chemistry, Trinity College, Jacqueline Busa, Student, Department of Chemistry, Trinity College

Analysis of colorants in paints used for easel paintings has become close to routine given technology available to many conservation laboratories. However, the same is not true for the determination of binding media which requires more complex technology for exact determination or, at least, technology that yields plausible identification of such media. Methods, such as FTIR, FTRaman, GC-MS, for determining such media require initial separation of components before identification is possible. This work reports a method to determine binding media requiring no prior sample preparation. The method uses Direct Analysis in Real Time - Time of Flight-Mass Spectrometry (DART-TOF-MS) and has been applied to oils, resins (both natural and synthetic) and proteins. Identification relies on the mass spectrum profile of a given material rather than on the identification of specific mass fragments. Results for each class of binder as well as mixtures of oils and resins will be presented.

(20) Solvent Sensitivity of Water-Mixable Oil Paints

Kelsey Fox, Graduate Student, Queen's University Department of Art History and Art Conservation

Water-Mixable Oil paints (WMOs) were introduced in the 1990s as a less toxic alternative to traditional oil paints. Generally speaking,

these paints are manufactured by introducing a surfactant or emulsifier to the linseed oil binder so that the paint is water reducible. It is hypothesized that WMOs will be more sensitive to polar solvents than traditional oil paint due to their hydrophilicity. Currently, little is known regarding the aging process and behavior of WMOs. This study aims to determine to what extent commonly used solvents might swell and leach components in WMO paint in a typical cleaning scenario. Samples of Winsor & Newton™ Artisan Water Mixable Oil Colour™ and Winton Oil Colour™ paints in two colors underwent accelerated thermal aging and were subsequently immersed in distilled water, ethanol, and acetone for varying periods of time. Color and gloss measurements were taken before and after exposure in order to assess visual changes to the paint. Hardness testing was performed in order to assess physical consequences of the loss of paint components. The solvent extractable components were analyzed using Fourier Transform Infrared Spectroscopy (FTIR) and Gas Chromatography Mass Spectrometry (GC-MS) and quantified by documenting changes in weight of the paint samples. This study is meant to be an introduction into solvent resistance of WMO paints, and also seeks to explore pigment type as a potential factor in solvent sensitivity. An understanding of WMO paint behavior may help conservators evaluate the suitability of commonly used solvent cleaning methods to this new and increasingly popular medium.

(21) Technical Analysis of Watercolor Pigments in Early American Fraktur

Kesha Talbert, Assistant Paper Conservator, Etherington Conservation Services

A study published by John Krill and Janice Carlson in 1978 in JAIC was one of the first examples of the use of X-ray Fluorescence (XRF) spectroscopy as a non-destructive means to study artist materials and the results of which changed the way scholars understood and wrote about fraktur and fraktur artists. Prior to the work of Krill and Carlson scholars believed fraktur artists were using a "home-made" palette of naturally derived materials. The results of the XRF analysis however showed that the pigments employed in fraktur were similar to those used in early American watercolor and had elemental signatures to suggest they were commercially available watercolor pigments such as vermillion, Prussian blue, red ocher, etc. commonly sold by artist colormen of the period or in pharmacies.
A similar study conducted at the Colonial Williamsburg Foundation (CWF) as a corollary to the exhibit "Paper Trail: Documenting Rites of Passage in German-Speaking America" at the Abby Aldrich Rockefeller Folk Art Museum was intended to expand the amount of information known about fraktur media and what, if any, trends might be observed based on artist or region. The study was designed to maintain an emphasis on non-destructive sampling methods, though samples were selectively taken in an attempt to identify pigments assumed to be organic based on their lack of elemental signature. In the case of suspected organic pigments samples were taken under magnification for polarized light microscopy and FTIR analysis. The results of this analysis affirm those of the previous study by Krill and Carlson and provide additional in formation about the organic yellow pigments found in several of the examples studied in this project. While in general the pigments observed in the CWF sample set are a select number of commonly available and commonly used watercolor pigments, preferences or patterns within the palette may exist based on artist or region. Since fraktur were rarely signed by the artist and are currently attributed mostly by style of imagery or locations/dates provided in the text of the certificates, developing a catalog of quantitative information from well provenanced and attributed examples could aid in the accurate attribution of little known or studied fraktur in the future.

(22) Rescue of a Decorative Element of High Symbolic Value in the Old Convento Santa Teresa De Jesús

Lisette Alvarez, Restorer and Conservator of Fine Arts, Monuments Restoration Company, City Historian's Office; Luis Alberto Hernández Armas, Assistant Professor, theoretical - practice of restoration of polychrome, Workshop School "Gaspar Melchor de Jovellanos," Historian City Office

This paper deals with the methodology used in the process of rescue and restoration of the decorative piece present in one of the outside galleries of the first cloister of the convent of Santa Teresa of Jesus, last convent of nuns to settle in what is now the Historical Center of the Old Havana, Cuba, World Heritage Site. This enclosure was built between 1696 and 1702, and was founded by Bishop Diego Evelino de Compostela. There, the religious order of the Discalced Carmelites had a home until 1928 when issues related to the urban development around this religious building, made them reach the decision to move to the area of Vedado which was, at that time, a new neighborhood of Havana. The monochromatic ornament that we worked on covers an area of 1892 cm2 approximately. It consists of a cross of mound, and a rosette, which theorizes that the rose is the wafer and the body of Christ and the cross, symbolizes Christ's death. This drawing expresses the rise of the soul of Jesus Christ to immortality. According to the characteristics perceived, the drawing based on lines and dots, was transferred to the plaster with the "al fresco" technique: Subsection the cardboard and whitewashed, where the black color on a light ocher background predominates. The intervention on the mural began before May 2007, anticipating the upcoming heavy raining of the season, which would exacerbate the bad state of conservation of the mural, or would cause the total loss of this significant painting. A multidisciplinary team of professionals involved with the matter was gathered. A critical study was carried out (test; etiologic, archaeological and technological) to determine the historical, artistic and technical values of the work as well as the conservation status and possible causes of their deterioration thereof. After analyzing the results of the preliminary investigation, it was determined that it was impossible to make an intervention on the ground, so we decided to work this element in a restoration workshop. The project was then subdivided into the following stages:

1. Preventive conservation: Measures of caution over the area not attached, in order to prevent the detachment of this at the time of extraction.
2. Removal of the decorative element: realization of the technique of the stucco aiming to separate the wall decoration where it was located.
3. Conservation of decorative element: treatment of assurance made to the stucco, to provide stability and cohesion before moving it.

4. Conservation and preparation of the area discovered in the wall: treatment of curative and preventive conservation for reintegrating the fragment taken to his place of origin.
5. Fragment return to its original place: Today, it is expected that the restoration work finishes relocating this mural decoration in its original site since a mural is closely linked to the building for which it was created.

(23) Re-Examination of 'While Baby Sleeps'

Makedonka Gulcev, Graduate Student, Art Conservation, Queen's University; Alicia Boutilier, Curator of Canadian Historical Art, Agnes Etherington Art Centre, Queen's University; Ron Spronk, Professor of Art History, Art History Department, Queen's University; Alison Murray, Associate Professor, Art Conservation, Queen's University

This interdisciplinary study examined a painting by the Canadian painter Paul Peel entitled "While Baby Sleeps," whose attribution is currently being debated. The painting is owned by the Agnes Etherington Art Centre located on campus at Queen's University in Kingston, Ontario. During a treatment in 1986, the signature in the lower left corner, "PAUL PEEL/PARIS -1888," was shown to have been placed on top of the varnish layer. Additionally, in the lower right-hand corner, scratch marks were observed, revealing remnants of another signature. During examination, paint texture with no correspondence to the present image was detected in the centre and background areas of this painting.

In the current study, "While Baby Sleeps" was examined with x-ray radiography, ultrahigh-resolution macro infrared photography, infrared reflectography, ultrahigh-resolution visible photomacrography, UV-fluorescence photography, and XRF. Cross-sections were obtained from both the textured and adjacent untextured areas to determine if there are any differences in stratigraphy. Cross-sections were examined by polarized light microscopy (PLM) and scanning electron microscopy coupled with energy dispersive x-ray spectroscopy (SEM-EDS). Micro-samples were also taken for pigment identification to ascertain whether they are consistent with nineteenth-century pigments. Micro-samples were analyzed using PLM, Fourier transform infrared (FTIR) spectroscopy and x-ray diffraction (XRD). In conclusion, these studies may be used to confirm whether the painting at the Agnes Etherington Art Centre is by Paul Peel.

(24) What Happened? One Woman With Two Faces

Ting-fu Fan, Chief Conservator, San Jian Art & Conservation Co., Ltd.; Yi-Chiung Lin, San Jian Art & Conservation Co., Ltd.

Considerations between conservation/ tradition /history of An Ancestor Portrait, Historical something happens ? Under what circumstances, produce this result ? This is a conservation case study of an ancestor portrait collected by National Taiwan Museum. In this case we hope to discuss how the conservation process has been made and proceeded between considerations in restoration, science, Taiwanese culture and traditional folk artworks. For Taiwanese people, it is a traditional virtue to commemorate their ancestors. There are different ways of remembering them, such as carving names on wood as ancestral tablets, portraying ancestors as hanging scrolls for the convenience of carrying and displaying. This type of artwork is considered not only to commemorate but also to pass down the concept of family glory culture. The chosen ancestor portrait was a heavy colored painting portrayed both husband and wife, and mounted as a hanging scroll. The deterioration conditions were typical among this type of hanging scrolls, such as creases, loss, abrasion etc. However, the special and different part that we'd like to bring out was that the wife's face was a cutout and pasted carefully onto the original face which was only half completed. This paste method was considered rare in traditional mounting technique. Generally, most mounters would cut the wrong or the unwanted part off, then inlay the new painting or pattern, in this case the new face. With this obvious faceoff, brings out many discussions and considerations and imaginations.

We hope through this case study, present the discussions and decisions during each process between conservator and the museum, moreover the descriptions on Chinese painting conservation concepts. In the meantime, to talk about the present situation how public museums authorize private conservators to execute conservation projects.

(25) Graphics Atlas: New Process Identification Methodology

Alice Carver-Kubik, Photographic Research Scientist, Image Permanence Institute

Image Permanence Institute's Graphics Atlas, www.graphicsatlas.org, is a sophisticated resource that presents a unique, object-based approach for the identification and characterization of prints and photographs. Characterization and identification go hand-in-hand as each process has key identifying characteristics, but each process also has a range of variations. The underlying goal of our research is to better understand the relationship between graphic materials, processes, and aesthetic characteristics using primarily visual examination techniques. We believe this approach provides the foundation for preservation and care of image collections.

Graphics Atlas, officially launched in 2010, expanded on the work of fellows in the Advanced Residency for Photograph Conservation. In 2012 IPI received a three-year grant from the Andrew W. Mellon Foundation to continue work on the site. During the grant period the content of the site has greatly expanded, most significantly with the introduction of new Identification pages.

Based on the results of a survey of professionals in the field including photograph conservators, collection managers, archivists, and curators, as well as analysis of web metrics, and conversations with colleagues, we recognized that the Identification pages were both the most used pages on the site as well as the resource most in need of improvement. In response IPI developed a new approach to identification and conducted a complete overhaul of the individual Identification pages based on this methodology. The new structure divides identifying characteristics into three categories: Object, Surface, and Magnification. Under each category are sub-categories. For example, under Object are characteristics best seen with even illumination and that require no magnification, such as image tone, support material, and format. Likewise, the Surface section identifies

and illustrates surface characteristics such as texture and sheen. Magnification includes characteristics only visible with varying levels of magnification, like image structure. Each Identification page also has an Overview section that provides a list of key identification characteristics, common use dates, and an overview of the process. Each page is illustrated with high-resolution images accompanied by text that describes the connections between chemistry, technology, materials, and the aesthetic characteristics shown, providing the user with an informed approach to identification. The result of this three-year project is a sophisticated and comprehensive web resource with quantity, depth, and a broad scope of didactic information on graphic processes far surpassing that of any other print or web publication.

(26) Comparison of Commercial Light and UV Data Loggers

Anisha Gupta, Graduate Fellow, Winterthur/University of Delaware and Fine Arts Museums of San Francisco

While significant research has been conducted comparing environmental data loggers that record temperature and relative humidity, the conservation literature is lacking a formal survey of light and UV data loggers. Given the trend towards allowing more natural light into galleries, whether by opening up previously-shaded skylights or building floor-to-ceiling windows, closely tracking the light exposure objects experience over the long term has become critical. This in turn makes a thorough understanding of current light data logging options extremely important for museum professionals. This poster will investigate popular commercial light data loggers used in institutions, comparing and contrasting some of the most important aspects of the loggers. The features of interest will include:

- Accuracy
- Ease-of-use
- Price
- Dimensions
- Capabilities of the included software
- Detection range for illuminance and UV

Data will be collected by consulting the manufacturers and surveying institutions about their experiences with particular light data loggers. Light exposure can cause irreparable damage to works of art, but installing light data loggers throughout an institution is a costly measure. This research will provide the information museum professionals need to make an informed decision that suits their institution.

(27) Analysis of Rock Deterioration in Naqsh-e Rostam Reliefs By GIS (Geographic Information Systems)

Azadeh Ghobadi, PhD Candidate in Conservation of Cultural Heritage, Art University of Isfahan; Mohammad Amin Emami, Assistant Prof., Art University of Isfahan; Jenoos Gashasy, Rs/GIS expert

Naqsh-e Rostam is known as an ancient periphery which is located in northwest of Perspolice in Fars Province, Iran. The oldest relief at Naqsh-e Rostam is severely damaged and dates to 1200 BC. There is a Rock relief thought to be Elimate, originally. Four tombs belonging to Achaemeind kings are carved out of the rock face and seven oversized rock reliefs at Naqsh-e Rostam depict the monarchs of the Sassanid period.

These works are located in orographic mountains which expose overall to interaction with their surrounded environment. Therefore existing deterioration as well as erosion process is mainly observed due to climatically conditions and geo-environmental factors that have influence of causes such challenges.

Transverse Cracks and micro cracking are most kinds of damages that will result erosion in whole of these works. The focal pressure sources, which cause cracks in rock surfaces, has been studied with Aerial Photography and Satellite Imagery and analyzed with respect to GIS system. GIS in this area of research involves the design of instruments that can accurately monitor changes in geo-environmental conditions over time that have significant impact on works. Finally the gullies effect has been identified in the back of the rocks. This type of monitoring allows conservators to observe effect changes geo-environmental conditions on archaeological sites, and based on these results, make recommendations to conservators to protect these works from further damage for preventive conservation.

(28) Microorganisms Influence the Mechanisms of the Rock Erosion at Tang-E Chogan

Azadeh Ghobadi, PhD Candidate in Conservation of Cultural Heritage, Art University of Isfahan; Mohammad Amin Emami, Assistant Prof., Art University of Isfahan

The rock reliefs of "Sasanian king Shapur II at Tang-e Chogan" gorge, close to "Bishapour" one of the most important ancient works in Iran, and known as "Bishapour" reliefs is unique when considering both its style and its imaging. Erosion evaluation of the "Chogan" reliefs due to many causes, such as biological and atmospheric damaging and others which are not well known, the facade has been seriously damaged during the last 50 years. Due to Unspecified reasons, the fresh rock is dominated by black layers. In this study several experiments were carried out on the stone surface. Elemental analysis from X-ray fluorescence microscopy on samples shows carbon dioxide and organic matters, whereas the matrix is composed of Cao, Sio2, Fe2o3, and Mgo. Transmission electron microscopic observation showed that various types of lichens. Experimental results indicate that the formation of both minerals must be attributed essentially to the action of kinds of lichens and Cyanobacteria (Species: Lempholemma isidioides + Thallinocarpon nigritellum) which live and proliferate on the stone. The rocky carving seems strong but is actually extremely sensitive to erosion caused by lichens, fungi, and bacteria. Water-adsorbing and microorganisms influence the mechanisms of the rock erosion. Since many lichens are frequently exposed to dry condition in nature, the change between dry and wet conditions may be an important process for the growth of lichens. Finally proposed treatment for prevention of lichens erosion is removal by low-pressure Blast Cleaning technique using Dry Ice.

(29) ABC Chemical Cleaning Effectiveness on Cultural Materials

Clare Boczon, Research Assistant, William and Mary Applied Science, Emily Williams, Conservator of Archaeological Materials, Colonial Williamsburg Foundation, Michael Kelley, Professor, College of William and Mary Applied Science

In conjunction with Hughes Associates, the National Fire Protection Association, and the Colonial Williamsburg Foundation, William and Mary's Applied Science Department has been studying the effects of ABC dry chemical powder, a common fire extinguisher agent, on cultural materials. Seven cleaning methods were tested on twelve sample types to understand how best to remove ABC dry chemical powder, which is the main component in many hand-held fire extinguishers prevalent in museums and public spaces. The cleaning methods tested include: rubbing with a soot eraser; brushing; vacuuming; swabbing with deionized (DI) water; swabbing with a mixture of DI water and detergent; combining vacuuming, the soot eraser, and swabbing with DI water; and combining vacuuming and swabbing with DI water. These were tested on twelve sets of modern materials simulating common cultural materials: untreated wood, treated wood, leather, painted canvas, tile, marble, travertine, brick, deer fur, iron, aluminum, and copper. Efficacy was assessed through the use of microscopic imaging of the materials prior to powder exposure, at exposure, and after cleaning. Microscopes used include the "HIROX" digital optical microscope and the "Phenom" scanning electron microscope in the William and Mary Applied Research Center Lab. This presentation will discuss the results of the tests, their implications for treating materials exposed to ABC powder and future research avenues.

(30) Examining Paintings on Wood Or Canvas Using 3D X-Ray Imaging With Digitome®

Daniel Boye, Professor of Physics, Davidson College, Rebecca Garner, BS in Physics candidate, Davidson College, Ryan Kozlowski, BS in Physics candidate, Davidson College

X-ray imaging in three dimensions offers many exciting possibilities for application to art and artifacts. We will demonstrate application of 3D x-ray imaging to the examination of several paintings on wood or canvas with supporting understructures in the form of cribbing or stretcher bars.

Conventional 2D x-ray images of such paintings taken in transmission show a superposition of the paint layer, the wood panel or canvas plus the horizontal and vertical cross pieces from the underlying support. The number of x-ray photons transmitted through the wood panel or support alone can be similar in magnitude or even less than through the paint layer. The result is a reduced range of contrast for all items of interest. Different methods are in practice that reduce the obscuration of the paint layer by the wooden support structure either by physically adding material to fill in the gaps of the support or through image post-processing. These methods can be time-consuming, requiring different adjustments for each painting. 3D x-ray imaging with the Digitome® technology offers a generally applicable means for examining the separate components of a painting and its support structure. Unlike Computed Axial Tomography (CAT) which acquires data based on a pre-determined set of cylindrical coordinates, the Digitome® technology employs a series of conventional 2D x-ray images of an object taken from different perspectives using two degrees of angular freedom. Each image contains the entire volume to be examined so no interpolation between slices is needed as in CAT. The perspective angles chosen and the active area of the digital radiography (DR) plate determines the volume that can be viewed. Feature resolution depends upon spot size of the x-ray source, pixel size of the DR plate and relative source-object-detector distances. We have used the technology with a variety of sources and plates. Because of the relatively small amount of data gathered, scrolling through an object along any axis can be viewed in near real time with a typical laptop computer. The technology is portable so that exams can be made within an x-ray vault or out on the museum floor.

The user can adjust the level of the focal plane viewed to match that of the paint layer. Contributions to the view from the underlying support structure are then out of focus to the point that they can be disregarded and the full gray-scale range is spread over the view. The focal plane can be scanned through the painting to reveal cracks and insect damage within a panel, additional features on the backside of the panel or canvas, and information about the construction of the supporting structures. This information is difficult to discern with 2D radiography. With the information about geometry and distances used by the technology, highly accurate and precise measurements can easily be made of the wooden panel thickness and the width, depth and extent of cracks in the panel. For paintings on canvas, the thread size and count can be determined.

(31) Stability of Polyvinyl Butyral Polymers (BUTVARs) in Ultraviolet Light

David Thomas, Researcher, The Freer Gallery of Art and the Arthur M. Sackler Gallery; Blythe McCarthy, Andrew W. Mellon Senior Scientist, The Freer Gallery of Art and Arthur M. Sackler Gallery; Ellen Chase, Objects Conservator, The Freer Gallery of Art and Arthur M. Sackler Gallery

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

Cast films of Butvar B-76, Butvar B-98, Mowital B30H and Acryloid B-72 were investigated before, during and after undergoing exposure to ultraviolet light. Property changes were assessed using fiber optic Fourier Transform Infrared spectroscopy (FTIR), color measurements, solubility tests and visual examination.

To test the effectiveness of the materials in a situation more analogous to the wall paintings that initiated the project, samples of plaster were consolidated with each of the resins being studied. These

also were exposed to UV light and measurements were carried out similarly to those on the films.

(32) Capturing Watermark Using Reflectance Transform Imaging With 3D Modeling and Fast Fourier Transform Processing

Kurt Heumiller, Senior Imaging Systems Specialist, Yale Center for British Art, Jens Stenger, Associate Conservation Scientist, Institute for the Preservation of Cultural Heritage at Yale University, Soyeon Choi, Head Paper Conservator, Yale Center for British Art, Chelsea Graham, Digital Imaging Specialist

An attempt to capture clear images of watermarks on layered sheets of paper has brought us to a successful method using Reflectance Transform Imaging (RTI) coupled with 3D modeling and Fast Fourier Transform (FFT) processing. Here we report a set of procedures that can be used to help isolate surface impressions through RTI. Objects under study are a group of large-scale preparatory watercolors by Samuel Scott (ca. 1702–1772, British) in the collection of Yale Center for British Art. The primary supports of these watercolors are antique laid paper bearing watermarks, which are lined with one or two layers of textured canvas and other types of laid papers. X-ray imaging could not effectively capture the watermarks on the primary support because the canvas overpowered the x-ray images. Transmitted light imaging also could not be effectively used because of the overall thickness of the layered supports.

Reflectance Transform Imaging is typically used as an alternative to raking light photography, allowing the user to adjust the angle of the lighting to accentuate specific textures. However, the processing creates additional data that could be useful in interpreting impressions. The surface normal and depth map images created from the RTI process can help in identifying surface impressions, as they only illustrate the surface texture while ignoring coloring and pigment of the artwork or print. Using these images as a starting point, we can then refine them further in order to remove or mitigate distracting features in the surface and texture of the paper. A blurred copy of the image can be subtracted to remove slower changes to angle or depth (representing less than perfectly flat paper surface) while retaining sharper variations like those in the impressions of a watermark. A Fast Fourier Transform can then convert an image into a frequency domain where it is possible to isolate or remove repeated patterns such as chain lines (figs. 2c and 3d). As a result, impressions can be more clearly isolated, and watermarks and laid lines can be separated into distinct images. In the future, techniques like some of the ones outlined in this paper might be used in more automated systems for detecting and identifying impressions such as water marks, laid lines, and chain lines.

(33) The Adaptation of the Video Slider into a 'Microscope Bridge' as a Practical Alternative for Using a Stereomicroscope to Examine and Treat Oversize Flat Artifacts

Seth Irwin, Paper Conservator, University of Hawaii Hamilton Library

Stereo-microscopes are one of the most regularly used instruments in most conservation lab. In many ways it has become the 'workhorse' of many labs. While there are many types of stereo-microscopes available on the market, the ability to use a microscope on oversize materials can present a challenging problem. This is primarily due to the limitations of currently available designs for microscope stands that allow for a microscope to reach into the middle of a large artifact such as an oversize map or print where the viewing area desired is beyond the reach of a typical stereo-microscope stand. At present, currently available stereo-microscope stand designs are primarily limited to either an articulating arm, a boom stand, or a floor stand; all of which have limitations when an extended reach is required. These limitations can become apparent in the form of vibration issues, the inability to clamp the stand to a table, the danger of damage to the microscope should the stand tip over, the need to access an area beyond the reach of the stand, and finally the weight of the microscope head itself.

Often the solution for this problem has been to employ an alternative microscope stand design that operates in gantry or bridge style. The use of the 'bridge' design has been available for conservation for many years, but as yet this design has only been available in a custom built set-up by a few select manufacturers. These custom built 'bridge' set-ups are often very expensive and custom built to a specific location. The video sliding track is a device that has been used by both professional and amateur videographers for decades. It allows for the attachment of a device to a glider that can then glide smoothly along a track of varying lengths. Video sliding tracks are often inexpensive and lightweight. They are designed to be easily dismantled and packed away for travel, and video sliding tracks can be purchased with both a motorized slider or manually operated. In addition, a video slider can be set directly on a surface without the need for additional clamping or a heavy base plate. This poster will show how to easily and inexpensively adapt a video sliding track to a stereo-microscope focusing mechanism. This is particularly useful for oversize flat artifacts that would be treated on a flat surface where the stereo-microscope would be pointed straight down at the artifact. This stand will accept most standard stereo-microscopes and will allow for a conservator to reach desired viewing areas that are beyond the reach of most microscope stands. This will hopefully allow for a practical and economical method of using a stereo-microscope on oversize material.

(34) Discoveries and Challenges - Using XRF for An Inorganic Pesticide Contamination Survey at the Royal Saskatchewan Museum

Timothy Greening, Conservation Assistant, Royal Saskatchewan Museum

XRF has become a popular technique for conservation research in recent times, particularly for determining inorganic pesticide contamination on ethnographic and natural history collections. This poster outlines our observations while qualitatively surveying natural and Aboriginal Studies collections at the Royal Saskatchewan Museum. While our pesticides were our main focus, we found unexpected elements as well. This poster also offers explanations for the unusual presence of these elements which were not associated with pesticide treatment, but offered interesting information about the makeup of the artifacts themselves.

(35) A Presidential Frame Treatment: Monroe's Lafayette

Elizabeth Robson, Furniture Lab Conservation Intern, The Colonial Williamsburg Foundation

This poster presents an overview of the analysis and conservation treatment of the frame of a Portrait of Marquis de Lafayette said to have been painted by Samuel Lovett Waldo for President James Monroe. The frame has undergone at least 3 campaigns of gilding in its life as well as some bronze overpainting, all of which contributed to reducing the clarity of its decoration and presentation. It was determined that in order to recover the original definition of the frame components, particularly in the outer reed course, the newer layers should be removed wherever possible to reveal the underlying original gold, bole, or gesso that remained. This treatment was aided by the use of a benzyl alcohol Pemulen gel, which led to less solvent exposure than traditional solvent-based gels. Overall, the original material was found to be in poor condition, but the gold that has been uncovered will help in the selection of the proper carat of gold leaf with which to re-gild. Definition of the reed course has been recovered, and once the original material has been isolated and the surface has been smoothed over with a thin layer of gesso, the frame will be water gilt overall in the traditional manner. This in-depth treatment will truly reignite the original grandeur of this important frame. The portrait of the Marquis de Lafayette owned by Colonial Williamsburg is attributed to Samuel Lovett Waldo, a 19th century American portraitist who worked primarily in New York City. It is said to have an inscription on the reverse of the canvas reading: "General Lafayette AE [age] 67 painted for President James Monroe by S.L. Waldo 1824" which is now covered by a lining. Based on the timing, it follows that the portrait was most likely painted during Lafayette's triumphant tour of the U.S. in 1824-25, during which he visited all 24 states. He was able to meet with many of his old friends with whom he had fought in the Revolutionary War, including then president and good friend James Monroe. It is clear that such a portrait, if indeed owned by Monroe, would have been a dear possession as a remembrance of his French ally.

(36) What's the Worst That Can Happen? Accelerated Testing of Conserved Waterlogged Wood

Karen Martindale, Conservator, Texas A&M University Conservation Research Laboratory

Accelerated degradation testing is a method of materials testing that simulates and exaggerates the environment in order to observe the processes by which a material will degrade in a fraction of the time, thus saving companies both time and money. At its most precise, accelerated testing provides information that allows companies to provide warranties to consumers; however, even tests that lack that level of precision can provide valuable qualitative data. This paper describes the development of a low-cost accelerated testing chamber that can be implemented in any laboratory.

To test the efficacy of the chamber, white oak samples from the 17th century shipwreck La Belle were conserved using three treatment methods for waterlogged wood: bulking with PEG, freeze drying, and bulking with silicone oil. These samples were subjected to four accelerated environments for a twelve week period, representing:

1. an "ideal" museum environment,
2. a museum with little to no environmental controls,
3. storage with no environmental controls, and
4. cool storage.

Every week, dimensions and physical changes of each sample were recorded and each sample was photographed in order to document changes. The samples reacted to the accelerated conditions in a predictable way: the samples treated with PEG were the most reactive to the accelerated environments, the samples treated by freeze drying reacted to a lesser extent, and the samples treated with silicone oil did not visibly react. The resulting conditions of the samples prove that meaningful comparisons can be made between samples, even without the specialized weathering chambers used by industry. A simple accelerated testing chamber could easily be used to determine the efficacy of conservation treatments in different environments, or determine the damage materials and treatments may undergo due to natural disasters.

(37) The Secret Language of Spray Paint

Valerie Marlowe, Doctoral Candidate, University of Delaware

Post-disaster, Architecture, Wood, and Objects Conservators may encounter objects that have been spray painted, intentionally or unintentionally, for a variety of reasons. This poster presentation will explore the multitude of ways that spray paint is used as a medium for communication post-disaster (e.g. search and rescue markings) and as a mechanism for sensemaking for a variety of professionals who participate in disaster, response, clean-up, and rebuilding (e.g. first responders, surveyors, and public works employees). This exploration will provide Conservators with a greater understanding of the post-disaster environment and provide practical information that may enhance a Conservator's understanding of the history of objects they encounter that can subsequently inform conservation decisions.

(38) 11th Hour Conservation: Salvaging the Historic Surf Club

Bryon Roesselet, Architectural Conservator, EverGreene Architectural Arts

Construction of modernist Richard Meier's architectural vision of overlaying the historic core of the iconic Surfside, Florida Surf Club with a chrome and glass Four Seasons resort and Residences, required extensive alterations and reconstruction of the original buildings that impacted significant historic components contained therein. Designed by Russell Pancoast and opened in 1930, The Mediterranean Revival Surf Club played host to both Hollywood and political stars, ranging from Elizabeth Taylor and Frank Sinatra to the Duke and Duchess of Windsor, General MacArthur, and Winston Churchill (he painted watercolors in one of the cabanas). The original construction included the cabanas, guest facilities, and entertainment core, including the Crystal Dining Room, the Ballroom, and Peacock Alley, which serves as the main artery accessing the entertainment

area, shops and other resort facilities. The Four Seasons design has the modern facility floating over the historic structure. In order to construct this vision, massive support shoring in the footprint of the historic building was required. This shoring dictated the removal of the entire roof system of the Crystal and Ballroom. Consideration of the historic elements of the original building came in the eleventh hour, with site demolition and development already underway. R.J. Heisenbottle Architects (RJHA) were secured, in order to manage the emergency of dealing with these historic elements, who in turn contacted Evergreene Architectural Arts (EAA). An urgent on site meeting set up by Richard Heisenbottle, principal at RJHA, included representatives of the owner, general contractor, and EAA, to address the conservation and preservation of the key historic fabric in the historic core of the Club. While protection of the Crystal Room mural, "The Vintage" by Denman Fink, was the initial impetus for action, it became clear during this meeting that other significant components, including southern yellow pine stenciled beams in the Crystal room and Ballroom, and the significant Mooresque ornamental plaster ceiling, cornices, and capitals in the Crystal Room could and should be preserved. Creating a path to this end became the collaborative challenge for the group. Through further conversation, expert analysis, and available manpower mobilization capabilities, a plan developed for expediently dealing with the conservation and preservation needs while respecting the construction schedule. This involved dividing the tasks among the group. Initial recommendations for protecting and monitoring the mural in situ (the mural has a friable canvas support which was glued, attached with a robust lead paste adhesive) during the period the roof was off the building did not ultimately fit the construction needs of the general contractor. An alternate plan EAA created called for removal of the mural, transport to their New York Studio, conservation, storage in Miami at a fine art storage, and reinstallation after completion of the room. Further, EAA undertook removal of the plaster for storage by the owner for future reinstallation. Finally, the contractor labelled and removed the historic wood for later reinstallation. Urgent conservation needs such as those that arose at the Surf Club can be successfully addressed through cooperation of contractors, owners, and design professionals.

(39) Conservation of the Archaeological Site of Kotzia Square in the Center of Athens

Vasileios Lampropoulos, Professor, Department of Conservation of Antiquities and Works of Art, faculty of Graphic Arts and Artistic Studies of T.E.I. of Athens

Building new construction over the remains of in Ancient Athens is an environmental challenge to preserve the ancient history and the cultural identity of Athens, while accommodating the needs of a modernizing city. This paper will present important information about the project development, materials analyses, conservation, and site accessibility of an important historical and tourist site in modern Athens. During construction of an underground parking facility for Metro passengers in Kotzia Square, located in the center of Athens, an archeological site of the classical period was revealed. Every construction project, big or small, in Athens must be examined by Archeologists from the Greek Ministry of Culture to rescue, conserve, and enhance the site. It was absolutely essential to coordinate between the developers of the parking lot, and the archeologists, conservators, architects, and chemists. It is unusual in Greece to undertake such a complex project. The project was cooperatively funded by the European Union and the Greek government. The 200 m2 excavation revealed unique findings, including:

1. An ancient street, part of the Aharnean road, which once connected the center of Athens and Aharnai;
2. Part of the Themistoklean wall, which protected Athens in ancient years;
3. Ceramic workshops; d. An ancient cemetery with marble and ceramic sarcophagus; and
4. Several Archeological objects,which were removed to conservation laboratories and then were transferred to the Metro Museum, built to host objects from this excavations.

Qualitative and quantitative analyses of the site's construction materials were done to provide information about the ancient technology and of the composition of construction materials and informing necessary conservation procedures. Analysis of the stone, ceramic, mortar, and various sediments and depositions throughout the archeological site were analyzed by chemical analysis (compleximetry, gravimetry, etc.) and physio-chemical analysis (X-R.D., S.E.M. - E.D.X.A., X-R.F., and atomic absorption spectroscopy). Restoration of the site included:

1. Cleaning of the site using of mechanical and ultrasound methods.
2. Consolidation of the corroded surfaces using of inorganic saturated solutions of calcium hydroxide and special silicone resins.
3. Repair of the archeological site's components, including walls, sarcophagi, and workshops. The chemical composition of the repair mortars was formulated specifically to the site. Titanium dowels were also installed for support.
4. Compensation of the missing components were made by casting with specifically formulated mortars in silicone molds.
5. Reattachment of components and cosmetic compensation was done to improve the appearance of the archeological site.

Although there were many complexities and challenges, this project successfully preserved important information about ancient Athens and enhanced a valuable tourist location.

(40) Conservation of Zappeion Roman Baths in the Center of Athens

Vasileios Lampropoulos, Professor, Department of Conservation of Antiquities and Works of Art, faculty of Graphic Arts and Artistic Studies of T.E.I. of Athens

Building construction over the remains of in Ancient Athens is an environmental challenge to preserve the ancient history and the cultural identity of Athens, while accommodating the needs of a modernizing city. This paper will present important information about the project development, materials analyses, conservation, and site accessibility of an important historical and tourist site in modern Athens. During the construction of the Metro system in central Athens in 1992-2004, an archaeological site of a Roman baths was revealed at Zappeion. The bath was built in the late 3rd century

outside the fortifications of Athens, until Hadrian's expansion of the city, which encircled the site in the 1st century AD. This location was inhabited, used as a place of worship of many gods, and was a place of burials through the Geometric period. Excavations are required for all construction projects in Greece. The Ministry of Culture decided that the Roman bath should be kept in place, preserved and dedicated to the public. The excavation unearthed ceramic jars and other items from Roman Time. Approximately several artifacts were transported to laboratories for conservation and are now at the Metro Museum, dedicated for this excavation. The project was cooperatively funded by the European Union and the Greek government. Approximately the bath is 100 m2.

The building material of the Roman Bath included ceramic, stone, mortar, sediments and depositions. Qualitative and quantitative analyses of the site's construction materials were done to provide information about the ancient technology and of the composition of construction materials and informing necessary conservation procedures. Analysis of the stone, ceramic, mortar, and various depositions throughout the archeological site were analyzed by chemical analysis (complexiметry, gravimetry, etc.) and physio-chemical analysis (X-R.D., S.E.M. - E.D.X.A., X-R.F., and atomic absorption spectroscopy). The understanding of the ancient technology was applied to principles for contemporary conservation procedures for archeological sites: cleaning, repair, and compensation and aesthetic restoration of ceramic, stone and mortar. Various unwanted and inappropriate materials were removed using ethical conservation methods of cleaning the stones, ceramics and mortars, using special pastes. Pastes were developed containing controlled chemical compositions and applied with a variety of poulticing systems. Pastes were applied in a thin layer, remained for one hour, and removed using deionized water. After each cleaning, measurements of pH and specific electrical conductivity of the leachate were undertaken to determine if the removal of acidic or alkaline residues of cleaning and soluble salts were drawn away. Attachments, welding, and aesthetic improvements were made, according to international ethics, regulations, and procedures that are applied to similar projects. This important site has been made accessible to visitors and the artifacts are protected by housing them in a dedicated museum. Although there were many complexities and challenges, this project successfully preserved important information about ancient Athens and enhanced a valuable tourist location.

(41) The Sectional Mannequin: A Unique Approach for First Nations Clothing

Caroline Bourgeois, Conservation 3-D Assistant, McCord Museum

This poster demonstrates the advantages of made-to-measure, sectional mannequins, which are composed of a number of different elements fabricated with a variety of materials and facing fabrics. The sectional mannequin is particularly valuable in the display of First Nations clothing, whose constituent materials and unique silhouettes pose a challenge to more traditional methods of mounting. The sectional mannequin permits components to be inserted into a garment independently, significantly reducing the stress that can occur when a one piece mannequin is used. The independent insertion of mannequin sections also facilitates the mounting of garments with unusually small openings. As well, the different sections of a composite mannequin can be made with a range of materials, such as buckram, metal and Mylar, depending on conservation requirements and the desired final appearance.

Sectional mannequins are made with flexible and rigid parts which can be either attached to each other or layered, one over the other. The flexible components can vary in thickness and are created to closely undergoes during mounting because they can be compressed while inserted, and once in the garment serve as an internal support during subsequent handling and mounting. As well, this element acts as a protective interlayer during mounting, absorbing the friction caused by sliding a garment onto a support. The flexible component is the link between the rigid section of the mannequin and the garment. The rigid component forms the skeleton of the mannequin, and is made in one or more sections which can be easily connected to each other with a variety of fasteners. The skeleton underscores the silhouette of the garment and must be strong enough to support its weight. The sections of the mannequin are covered with a variety of fabrics, either smooth or textured, depending on conservation requirements. Smooth or slippery fabrics are used to prevent a very fragile material from catching on the mannequin, or to facilitate the insertion of the mannequin components into the garment. This can be an issue with First Nations garments, which are usually not lined, and which often have materials with a nap, such as suede or fur, on the inside. Textured fabrics are used when the materials of a garment have lost their structural strength, or when a garment is heavily decorated or does not have traditional fasteners. These fabrics effectively extend the support function of a mannequin along its length, lessening the overall effect of gravity on the skin or the fabric of the garment.

(42) First Aid Strategies of Rare Ancient Egyptian Textiles in Excavation

Harby E. Ahmed, Associate Prof of Historical Textiles Conservation, Faculty of Archeology, Cairo University

The excavation of Tuna el-Gebel was a scientific joint venture between the Institute of Egyptology of the University of Munich, Germany and the University of Cairo, Egypt. The ibis burial place at Tuna el-Gebel, located at west of the ancient city of Thermopolis Magna, has been the first, and for a long period, the only ibis and baboon animal cemetery during the reign of Pharaoh Pasmetkhos (664-619 BC). Among the findings of the excavations several pieces of rare textiles were unearthed. These textiles were found in poor conservation state and risked further deterioration if left untreated. A close examination of the textile was followed by various Nandistractive analyses in order to develop a plan of conservation treatment. This research shows the practical strategies which have to be followed in maintaining and conserving textiles. The effects of cleaning materials on the natural dyes were tested. Dry cleaning was used to remove resistance stain and dirt. The process of maintenance and restoration has been recorded step by step--beginning from the historical record of the textile to the cleaning process with its different kinds. Add to this, the processes of fixing pieces on new holder as a preparation for displaying or storage in museum.

(43) Sending Clam Shells Across the Atlantic: Preparing the Alexander McQueen Razor Clam Dress for Loan

Cassandra Gero, Assistant Conservator, Metropolitan Museum of Art, Costume Institute

This poster will detail the packing of the Alexander McQueen razor clam dress for loan from the Metropolitan Museum of Art to the Victoria and Albert Museum for their iteration of the Savage Beauty exhibition. The trip from New York to London included plane, ferry, and truck travel.

The dress, which is from McQueen's spring/summer 2001 Voss collection, is covered in approximately 1,200 razor clam shells that have been bleached, drilled and sewn to the dress fabric with monofilament. The shells are fragile and make the dress heavy and difficult to handle. Prior to the loan, reproduction shells were made from paper so that distracting bald spots on the dress could be filled in if necessary. These were created by taking photos of the real shells, printing them on archival photo paper, cutting them out and curving them to mimic the shells' natural shape. Due to the difficulty encountered in mounting the piece (the process required 5 people), it was decided to ship the dress to the V&A on a mannequin. This made installation easier, but packing much more challenging. A custom crate was made for the dressed mannequin, but internal packing was also required to keep the shells from crashing against each other and the fiberglass mannequin. Custom Tyvek and polyester batting pads, tissue, and other materials were used to pad the shells and keep them safe and stable for travel. The packing process was ultimately successful, and the dress arrived in London intact, and also made it back to New York safely after the exhibition.

(44) Feeling a Little Blue (Green): Effort to Reduce Staining on a Flood Damaged Zuni Textile

Cathleen Zaret, Textile Conservator, Zaret Textile Conservation

In 2011 and 2012 a Cargill grant made it possible for the National Museum of the American Indian (NMAI) conservators and fellows to conduct a place based education program with Pueblo and Navajo communities in the Southwest. During both visits, the team met Zuni master potters, Milford and Randi Nahohai. As the Nahohai family shared their process of creating pottery, an ongoing relationship of friendship and trust developed. In 2012 the Nahohai family asked the visiting conservators if they would examine and consider attempting to reduce or remove stains on a flood damaged family textile. This was an opportunity for NMAI to do a favor-in-kind, giving back to the community. In 2013 as a new Mellon Fellow, I was entrusted with the care and treatment of their textile, a meha. The goal of treatment was to improve its appearance enabling the family to again wear the textile during religious ceremonies. Mindful of the challenge it would be, and conscience of the weight, responsibility, and honor caring for this family heirloom held, many treatment options were carefully pursued. This poster examines the processes and techniques used in the effort to reduce discoloration and staining due to the migration of dyes from colored wool embroidery yarns onto a white cotton ground.

(45) A Mount for Prevention is Worth a Pound of Care: Rehousing Festival Hats at the Textile Museum of Canada

Hillary Anderson, Conservator, Textile Museum of Canada, Genevieve Kulis, Conservation Assistant (contract), Textile Museum of Canada

The Textile Museum of Canada's collection of over 240 Chinese festival hats is considered one of the museum's most iconic collections. Appreciated for their whimsical appearance and ornate decoration these hats are also important for the cultural narrative to which they contribute; revealing details about traditions, beliefs, symbolism, materials technology and fabrication techniques. Although these hats are a significant part of the museum's collection, the ability to provide conditions conducive to their ongoing stability had previously not been possible, as a consequence of their challenging storage requirements. However, recently the collection has reached a critical point in its need for preservation and care. This has been due, in part, to the use of elaborate and extensive decorative elements on a sensitive material substrate (silk), which has manifested in the objects becoming structurally tenuous. In order to mediate this issue, the Textile Museum of Canada began a rehousing project for this collection, supported by funding from the Museum Assistance Program. This project involved creating a mounting system for the collection that can be used for both storage and display purposes. It also required that the system in question be designed to enable various individuals (staff, interns and volunteers) to create these mounts successfully, while simultaneously working within given budgetary, material and time constraints. Drawing inspiration from, and adapting, various textile mounting techniques from other institutions, a design and method of fabrication was developed that addressed the specific needs of the collection. This included custom internal mounts for each festival hat, a standardized mount stand, additional external supports to reduce weight stress from decorative elements, and a method of securing the mounts to trays and bases while in storage. This poster will present the materials and methods used during the development and fabrication of these mounts. The conservation benefits and outcomes of this rehousing project will also be touched upon, including the ability of the mounts to reduce current structural stresses to the hats, the prevention future damage due to direct handing and mishandling of the objects, and the enhanced ability to monitor the collection for potential future threats.

(46) Liquick Leather! No Need for a Professional! … Or Is there?

Lauren Calcote, Von Clemm Fellow, Boston Athenaeum

While conservators try to use materials that are stable and reversible over time, sometimes we are left to deal with the results of prior treatments that are neither stable nor reversible. At the Boston Athenaeum, one of these materials, Liquick Leather, was used in the 1950s as a leather preservative and repair material.

It was sold in a concentrated liquid form and designed to be diluted for use as a consolidant for degraded leather, an adhesive to repair broken joints, and generally a "quick and easy fix for all of your book repair needs" that is much better and cheaper than hiring a professional. While it was largely marketed for use on leather

bindings, the advertisement suggests using it on cloth bindings. Liquick Leather leaves a plastic coating on the spines of many leather and parchment books in the Athenaeum's collection that is visually distracting and damaging to the remains of the leather because it is stiff on the spines and in the joints. Currently the Athenaeum has no satisfactory solution for dealing with the books that were treated with Liquick Leather. The coating is either left in place or the leather on an affected item is removed and replaced. This is acceptable on some books, but for more important bindings a better method for removal is desired. The goal for this project is to determine a safe way to remove Liquick Leather from library materials including leather and parchment. Ideally this will include the identification of the resins in Liquick Leather to aid in identifying suitable solvents. Solvent tests will be included as well as any observed changes to the physical properties of the leather.

Examples of treatments will also be included.

(47) Valuable Textile Techniques and Training

Nicole Giacomantonio, Student, Dalhousie University

The approach to, and techniques used in the conservation treatment of an early 18th century Jacobian embroidered needlepoint was heavily informed by my training in textiles at Nova Scotia College of Art & Design (NSCAD). Working as a pre-program intern, I used the knowledge I had gained from studying and creating textiles to proceed with treatment of this needlepoint. I considered and tested a number of the techniques I had worked with as an art student, such as dyeing, hand stitching, needlepoint, and embroidery. The needlepoint was worked in wool threads and yarn, with silk threads and couched metal threads on a fine flax linen ground. Deterioration had occurred mainly where a previous conservation attempt had taken place in the form of a number of patches applied to the back of the needlepoint with rabbit skin glue. The threads that had come in contact with the glue had, over time, become stiff and brittle, and were coming loose from the patch and falling away in small chunks. Further deterioration had occurred in portions of the piece where needlepoint and petite point in silk thread had worn away. Dark brown stains covered the top right corner of the piece.

I began by removing the lining and vacuuming both sides of the piece with a Hepa filter vacuum. I moved on to spot removal treatment of the piece in the areas with large brown stains using a mild bleaching agent of sodium Perborate and NaCl gel and a rinse with isopropyl alcohol and distilled water applied with a sponge brush, following the treatment protocol of Ms. Elise Rousseau of Conservation de Rigueur, where this treatment took place. After the piece was fully dried I moved on to stabilize the deteriorated sections of needlepoint. After analyzing the piece, I decided to experiment with dye samples of linen and thread to match the colors of the needlepoint where the threads had worn away, to possibly use as patches behind the holes and tears. I studied dying during my art school training, and am now working further with dying techniques at the Center for Art and Design in Halifax. The Conservator in charge, Ms. Elise Rousseau, decided we would use purchased pieces of linen in dark brown and beige in order to avoid variations in dye from sample to sample. The dark neutrals matched the faded colors of the piece and became unnoticeable as stabilization patches even when they showed through to the front. I used a basic couching stitch and laid and couching stitch to redefine shapes in the embroidery where the thread had partially torn away. I used back stitch and darning stitch to stabilize the weak areas, holes and tears, and for mounting at the end of the project. This treatment is an honest example of how techniques and materials learned in Art School and crafts training provide a strong basis for conservation work. I look forward to continuing my training as a professional Art Conservator in a graduate program.

(48) Fabrics for Disaster Response: the Absorbency of Microfiber Fabrics – A Comparative Survey and Analysis

Michele Pagan, Textile Conservator, Private Practice,

The purpose of this research is to advise the professional art conservation community regarding the choice of various microfiber fabrics in emergency situations for the removal of water, soot and assorted soil from the surface of fragile artifact surfaces. Scenario: you are called upon to participate, as part of the salvage effort for some disaster that has occurred. It may be as large as a municipal flooding event, a furnace puff-back throughout a private home, or a burst waterpipe in your own workroom. Where do you go, to grab a large amount of absorbent material, as part of the response effort:

- Do you head to the local big-box store, to buy a large quantity of microfiber scraps?
- To your local fabric store, and buy an entire bolt plush? -, To the closest thrift store, to buy up all the used cotton flannel sheets which they have in stock?
- To the local Auto-Zone, to buy a stock of thick, absorbent car-detailing cloths?
- Do you call a local housecleaning service, for a large quantity of absorbent, disposable wipes?
- To the nearest drugstore to buy all the disposable baby diapers in stock?

Microfibers—more properly called micro-denier fabrics because of the extremely small diameter of the synthetic fibers used—are used variously by conservators of all specialties to surface clean cultural material.

Manufacturers of microfiber fabrics offer hundreds of different microdenier fabrics, and various explanations on their websites for the success of their particular microdenier fabrics, in absorbing liquids and removing soil, including:

- fiber content
- yarn structure
- type of fabric geometry
- surface characteristics

In this research project, a set of microdenier fabrics was collected, with emphasis on including those most easily available, and best representing the types of synthetic fabrics currently available to conservators. Many of the samples were recommended for this study, by individual conservators. Photodocumentation was performed first, to accurately describe the physical characteristics of each fabric. Their weight, as measured by grams per square meter (gsm), were compiled. The performance-testing phase, was conducted at the Drycleaning and Laundry Institute, Laurel Md. Industry standard absorbency testing procedures, including those of AATCC test method protocols, were conducted. Absorbency by both immersion

and vertical wicking was tested, and test results compiled. Fiber content—percentage of polyester and nylon—and fabric structure—woven, knitted, nonwoven—were the key indices used as the basis for comparison.

(49) Facing the Unknown: Conservation of An Anthropoid Clay Coffin From Tel Shadud, Israel

Elisheva Kamaisky, Head, Pottery Conservation Unit, Israel Antiquities Authority

In 2013, preparations for a gas pipeline in northern Israel resulted in an Israel Antiquities Authority (IAA) salvage excavation at Tel Shadud where a rare anthropoid coffin dating to the Late Bronze Age (1200 BC) was discovered. These clay coffins with human attributes sculpted on the lid are associated with ancient Egyptian burial rituals of high rank officials. The coffin was around 2 meters high and about 0.50-0.70 meters in diameter, weighing an estimated 150-170 kg. Interest in this unexpected discovery was high, resulting in almost immediate requests by several museums to exhibit the piece as soon as it was conserved and reconstructed. The last anthropoid coffin was discovered nearly 50 years ago meaning that nobody in the IAA Pottery Conservation Unit had direct experience in dealing with an artefact of this size and complexity. Despite the demand for speed, it was recognized that proper planning despite being time-consuming, would be essential to reduce errors, eliminate the unexpected and ensure a successful treatment and the future welfare of the object. The planning stage, which lasted about three months, included developing a team with the necessary skills and experience to prepare for the unexpected elements of treating this oversize artefact, including finding solutions for: choice of work-space for different stages of treatment, mobility of the object during treatment, joining the lid safely to the body so it could be removed as needed, and choosing and testing materials that would suit the treatment. Post-treatment needs that had to be anticipated, including planning for a travel case that would protect the object during transport as well as exhibition needs. All this on a public sector budget. Only after these decisions had been made did treatment begin. The presentation will detail the treatment choices including cleaning, consolidation, reconstruction, analysis, construction of an innovating interior support and project documentation. As inevitable unexpected situations arose during treatment, we found that our preparations were worthwhile and the anticipated solutions proved successful, allowing treatment of this complex artefact to proceed smoothly and quickly. In an institution where most treatments are standardized, the successful approach to this unusual treatment taught us that spending time and efforts on preparing for different scenarios shortened the actual working time and avoided the unexpected.

(50) Encountering Unexpected Challenges in Okinawan Lacquer Conservation

Stephanie Spence, MA, CAS Candidate in Art Conservation, SUNY Buffalo State; Anya Dani, Art Conservator, Okinawa Institute of Science and Technology; Amaris Sturm, Graduate Fellow, Art Conservation, Winterthur/University of Delaware

This poster will highlight treatment challenges found in three Okinawan urushi lacquer objects belonging to the Yomitan Museum of History & Folklore. The objects were treated in the conservation lab at the Okinawa Institute of Science and Technology, Art Conservation Program. Okinawan lacquer objects are a special class unto themselves. As the southern-most group of Japanese islands, Okinawa has a truly international history involving links to China, Southeast Asia, mainland Japan, and the United States. The Okinawan islands have their own unique material culture that draws from these varied influences. For example, the popularity of red lacquer is influenced by China while shouchikubai motifs (pine, bamboo, and plum) are influenced by mainland Japan. At the same time, homegrown Okinawan lacquer techniques such as tsuikin, the application of raised and colored urushi appliqués, are immensely popular.

In Japan, lacquerware has been traditionally conserved using urushi-based materials. These techniques are highly revered and still practiced throughout Japan by highly trained conservators. When first embarking upon the conservation of Okinawan lacquerware we expected to find urushi repairs. However, to our surprise we instead encountered a variety of restorations using synthetic materials. Okinawa has very few conservators; meaning local people likely fix their objects themselves using materials on hand. Overall Okinawan lacquerware is especially in need of conservation. Although the high humidity is ideal for initially curing lacquer, in time the tropical environment can cause significant structural damage. As western-trained conservators, we strove to make culturally sensitive treatment decisions. We also had to carefully weigh the use of aqueous treatments. Although the light-damaged lacquer surfaces were often water sensitive, moisture was necessary to relax raised areas. The treatment of a red lacquer rectangular tray with bird and tree designs involved somewhat aggressive cleaning as well as overpaint removal to remove thick layers of unsightly synthetic paint. This paint must have been applied during a previous restoration attempt. The treatment of a round red lacquer tray with papaya tree design involved extensive consolidation and loss compensation using a highly reversible colored acrylic putty insert. Lastly, treatment of a square-shaped red lacquer box with top tsuikin tree design involved removal of a synthetic coating, overpaint removal, and selective aesthetic compensation using dry pigments and Acrysol WS-24 acrylic dispersion. In Okinawa, we often encounter non-traditional lacquer restorations. Additional treatment challenges have been created through fluctuating relative humidity and prolonged light exposure. In addressing these challenges, we have developed a philosophy for using natural aqueous consolidants that would be familiar to traditional urushi conservators while also aiming for reversible synthetic aesthetic compensations. Where appropriate, mixing in Japanese techniques, such as shimbari clamping during consolidation, aids and enriches our treatment experiences.

(51) A Lucky Break: Treatment of a Kinetic Sculpture By Fletcher Benton

Amy Brost, Andrew W. Mellon Fellow, Conservation Center, Institute of Fine Arts, New York University

A kinetic sculpture by Fletcher Benton arrived at the conservation studio of Bek & Frohnert, LLC inoperable and partially disassembled. The work, "R-1013" (1969), is one of eight known "Rolling Discs" works created by Benton in the 1960s. The upper portion of the sculpture is a large open rectangular frame, rounded at each end, and

covered in sheet aluminum. Inside the frame, six colored discs (one each of red, orange, yellow, and purple, as well as two blue discs) roll back and forth on a series of tracks that are raised and lowered by a motor and wheel assembly hidden in a box beneath them. The base of the sculpture is transparent Plexiglas. Long enjoyed in a private home, the sculpture came in for conservation treatment without documentation of how it operated. This is unsurprising for a private collector, but in researching the work, it became clear that there is little or no published technical documentation of Benton's kinetic works. In order to repair "R-1013," Benton's studio was contacted to learn the correct order and orientation for the colored discs in the tracks, and to verify the behaviors of the sculpture while in motion. The fact that the artist and his studio were able to provide critical information about a work created almost 40 years ago was a lucky break. Lack of documentation imperils the survival of kinetic works in general. Reinhard Bek has suggested documenting kinetic works from two perspectives—that of the observer and that of the engineer. In this way, conservators will understand both the behavior of the work and the mechanical components underlying it. For this project, "R-1013" was described from both of those perspectives, and this poster represents the first published technical information about one of the "Rolling Discs" works. This case highlights the need to take the necessary steps to sufficiently document kinetic works, before it is too late. (This work was undertaken as a student project for the graduate conservation course "Art with a Plug - The Conservation of Artworks containing Motion, Sound, Light, Moving Images and Interactivity" at the Conservation Center, Institute of Fine Arts, New York University.)

(52) The Falcon Mourned Over You: Considering the Intangible in Conserving Dissociated Ancient Objects

Amandina Anastassiades, Professor, Artifacts Conservation, Queen's University, with Daniel Doyle, Megan Doxsey-Whitfield, Anne-Marie Guérin

In 2014 the Queen's University Master of Art Conservation Program acquired a set of Egyptian coffin lid fragments believed to date to the Third Intermediate Period (1069-663 BCE). The fragments were once part of Stanford Art Museum's collections. The Museum suffered an earthquake in 1989 that destroyed the building. Although no objects were damaged, the earthquake necessitated the temporary removal of the collections from their existing location, which took five years. The building then underwent extensive restoration work, to re-emerge as the Cantor Center of the Visual Arts. During the move, portions of unprovenanced materials were deaccessioned and given away to other institutions to be made use of for research and teaching. In this phase of deaccessioning, a particular set of coffin lid fragments from the collection, were divided between the Phoebe A. Herst Museum of Anthropology in the U.S.A, and the Canadian Conservation Institute in Canada. Both sets of fragments remained untouched by the two receiving institutions, until the fall of 2014, when CCI donated ten of its fragments to Queen's study collection.

The Queen's fragments represent a small fraction of the divided whole. From the largest piece, roughly 2 ft x ½ ft, to the smallest, 2 in x ½ in, there is great diversity in what survives of the painted layers. The most legible fragment depicts the canopic jars of Hapi and Duamutef. With consideration for the excellent state of preservation of the fragments, coupled with the extensive pre-existing literature on the manufacturing of Egyptian polychrome wooden objects, the students from the graduating classes of 2015 and 2016, chose to focus not on the study of the material but instead on the study of the intangible. In recent decades, the field of cultural heritage management has evolved to recognize the many facets of an object's value, largely due to the growing influence of indigenous communities the world over. As the conversation continues, the conservation and curatorial disciplines continue to embrace an understanding that the relationship of an object to its source community is inherent and vital. Most work in this area has been done in partnership with living communities. However, we are left with the question of how might conservators approach the conservation of ancient artifacts, objects for which no living source community can be consulted, while applying an intangible value framework to guide the treatment? It is this question that the authors explore in this paper. The core ethical considerations of preserving coffin fragments are examined, and emphasis is given to the effects of the newly recognized 10th agent of deterioration, dissociation. The challenges of respecting the original intentions of the source community within the context of the Queen's study collection are discussed. Finally, a plan is put forth for the digital reunification of the fragments and the creation of audio recordings of their inscriptions. This paper illustrates how a disaster has provided the opportunity to explore beyond the boundaries of a traditional approach to the preservation of this ancient material type.

(53) Pacific Silvercloth: Recommendations for Its Use As a Scavenger in Silver Collections

Gyllian Porteous, Master of Art Conservation Student, Queen's University; Lyndsie Selwyn, Senior Conservation Scientist, Canadian Conservation Institute; Amandina Anastassiades, Assistant Professor, Artifacts, Queen's University; Alison Murray, Associate Professor

Pacific Silvercloth is a common commercial product used in conservation both as a scavenger and barrier to reduce the tarnishing of silver objects. This research builds on the past work of Queen's Master of Art Conservation graduate, S. Smith, who conducted a series of Oddy tests to determine the effects of ageing on Pacific Silvercloth. Though her results were inconclusive, her observations of silver plating and corrosion on silver, sterling silver, and copper coupons, despite separation of the metals from the Silvercloth by a barrier layer, raise an important question as to the possible negative effects of employing this commercial product in silver collections. This study qualifies the risks posed by Pacific Silvercloth through a tripartite study. Firstly, an extraction on Pacific Silvercloth was performed to identify the presence of any pollutants within the cloth. Secondly, an accelerated ageing study was conducted, based on the Oddy testing model, which places Pacific Silvercloth in direct contact with silver, sterling silver, and copper coupons, in a high humidity and high temperature chamber. Finally, the effectiveness of commercial Pacific Silvercloth as a sulphur scavenger was be compared to two silver nanoparticle-impregnated cloth models made in house.

(54) Silver Maintenance at George Washington's Mount Vernon

Karl Knauer, Collections Conservator, George Washington's Mount Vernon; Julie Flynn, UCL

George Washington's Mount Vernon mansion proudly displays original Washington-owned silver objects in their original context. An ongoing maintenance program of lacquering over several years has had mixed success in protecting these surfaces from tarnishing. This poster explores some of the challenges facing these objects and evaluates the environment, including pollutants, in this historic house. Modifications to conventional cleaning methods and coatings are explored in an effort to achieve more durable results, and the performance of these alternative methods is evaluated.

(55) A Closer Look: In-depth Analysis of a Kokin-Bina Doll

Megan Doxsey-Whitfield, Assistant Conservator, Queen's University; Anne-Marie Guerin, Graduate Student, Queen's University Master of Art Conservation

The roots of Hina Matsuri, or Doll Festival, may have originated as far back as Japan's Jomon Period (ca. 3000 BCE - 200 BCE). It continues to be celebrated in Japan and by the Japanese diaspora today. The festival as it is known today centers around the display of a set of dolls called dairi-bina or "imperial couple" which may include a number of other dolls consisting of the imperial couple's courtiers. The kokin-bina, which developed during the Meiwa Era (1764-1772), gradually replaced all other styles of dairi-bina and remains the most popular style today. Given the predominance of kokin-bina, the manufacture of which follows strict stylistic rules, it is difficult to date these objects using connoisseurship alone. A kokin-bina from the Queen's University Master of Art Conservation (MAC) program study collection provided the unique opportunity for two students to conduct an in-depth technical examination using polarized light microscopy (PLM), Fourier transform infrared spectroscopy (FTIR), x-ray fluorescence (XRF), and x-radiation. Many elements of the kokin-bina were examined revealing the predominant use of silk and cellulosic paper elements, with metals such as tin, lead, silver, and copper in the decorative components. In spite of the doll's crude straw core, its attire is lavishly made using traditional weaving methods such as shuchin. The identification of toso, a wood composite paste poured into a mould to create the dolls' heads, as well as the possible presence of an early plastic film covering the eyes, were instrumental in dating the doll to the late nineteenth century. Placing the kokin-bina within a historical context, and understanding its material complexity, was best achieved through technical analysis. This information is valuable for collectors, and contributes to our understanding of the subtle changes in artistic choice within stylistic constraints. A greater understanding of what was considered acceptable change in the manufacture of these objects allows us a glimpse of the cultural meaning and value attached to kokin-bina in 19th century Japan.

(56) Holy Ship! An Inadvertent Discovery of a Shipwreck in Maryland Waters

Nichole Doub, Head Conservator, Maryland Archaeological Conservation Laboratory

Theoretically, the recovery of archaeological material takes place after thorough assessment of the site, viability surveys, budgeting and acquisition of necessary resources. This case study takes a look at how one SHPO office managed the inadvertent discovery and emergency recovery of a Maryland shipwreck. The Maryland Archaeological Conservation Laboratory, in collaboration with the Maryland Historical Trust and the State Highways Administration, facilitated the excavation and study of a large wreck assemblage and explores the possible futures for the recovered material.

(57) Restoration From Severe Water Damage of a Mid-20th Century Spinet Piano

Patricia A. Stewart, Owner, Humpty Dumpty Restorations

A mid-20th century mahogany spinet piano was damaged by the water leaking from the ceiling of the condominium unit directly above the instrument. The poster will present the method used by the presenter to repair the water damage to the wood and the restoration of the original finish. There was extensive water spotting that penetrated the outer layers of the veneer of the piano damaging the veneer extensively. The restoration took place over two weeks time and the methodology was as follows: drying of outer veneer using cool diffusion air source, application of thick layer of mayonnaise to entire damaged surface for a period of 12 hours, removing mayonnaise and applying fresh layer and repeating process over period of one week. At the end of the week, most water spots had disappeared under the layers of mayonnaise. Remaining spots were lightly sanded and a red mahogany stain was applied and quickly removed four times. Resulting finish on instrument was spot-free and wood regained moisturized texture. Completed work was allowed to saturate and dry for one week before piano was used again. There was no damage to keys or inner strings and tone units.

(58) Elemental Analysis of Alexander Phimister Proctor's Bronze Sculptures

Perrine Le Saux, Conservation Assistant, Yale Center for British Art; Allison Rosenthal, Pre-Program Conservation Intern, Buffalo Bill Center of the West; Vanessa F. Ocaña-Mayor, Conservation Project Volunteer, Centro de Textiles Tradicionales del Cusco; Nicole Schmidt, Art Conservation Technician Intern, Russell-Martin Conservation Services, Inc.

The following research project examines trends discovered among Alexander Phimister Proctor's Large Stalking Panther bronze sculptures. These trends were identified with information already available on the sculptures and new information found using X-ray fluorescence (XRF) analysis. Sixteen of Proctor's Large Stalking Panther bronzes were analyzed, many of which were cast at different foundries on different dates and now reside in museums and private

collections across the United States and Canada. This is the first study in which a bronze sculpture's patina and alloy have been analyzed separately using XRF. At the beginning of this project, known provenance information and elemental data on the sixteen Stalking Panther bronzes were catalogued and a method for identifying unknown foundry information was developed. The main identifying factor came to be the casting method. Proctor's bronzes were either sand-cast or lost wax, and each researched foundry had its own preferred casting method which was tracked and noted as a characteristic. From there, we compared the copper-to-zinc photon ratio in each sample and patterns began to form. At the outset of the project, the foundry information was known for all but one Large Stalking Panther. Using our developed method and other photographic evidence, the "missing" foundry was identified as Gorham. We were also able to identify a pair of bronzes that have been cast at the same location on the same date, which we later nicknamed the "twin" bronzes. Cursory analysis of the Large Stalking Panthers and other sets of Proctor sculptures show each foundry cast each group of bronzes somewhat consistently. We may not be able to extrapolate information about a Gorham Large Indian Warrior based on data from a Gorham Large Stalking Panther, but it appears that we can draw conclusions about specific bronzes based on data from the same group of bronzes. The hope is that as more of the XRF data from Proctor's known bronzes is analyzed, it will become possible to compare bronzes from other North American and European foundries and draw elemental connections among similar sets of bronzes. This information will prove useful to both curators looking for details about Proctor's foundry practices and conservators looking to identify harmful chemicals on the surface of their bronzes.

(59) Fire and Bone: A Technical Perspective on Charred Bone Pigments

Riley Cruttenden, Program Assistant, Undergraduate Research Office, Ohio State University,

Bone and fire evoke the technology of early humans, and charred bone has been used in paint making as long as 100,000 years ago. The use of bone black pigment is well-documented across history, and its production is easily accomplished with accessible materials. Bone black was made exclusively by hand until it was commercially available to artists in the eighteenth century, though early nineteenth century developments quickly gave industrial applications priority in the production of bone pyrolysates. Charred bone products continue to serve as important industrial additives and absorbents, with only a small portion marketed for art professionals. These modern products differ from historical descriptions of bone pigments and some, like bone brown, aren't currently produced. An understanding of how variables in small-batch bone pyrolysis affect resultant pigments is useful in understanding differences from commercially available bone pigments, extracting historical data from pigment samples, and providing guidance to art professionals interested in technical aspects of charred bone. To better understand variables in bone pyrolysis as applied to historical pigment production, several historical sources (Hilliard, Field, and Dossie) were consulted alongside new scientific data about variations of color and crystallinity in charred bone. Information from these sources were distilled to create twelve bone pigments: fresh bone was prepared in three degrees of cleanliness and each charred at four temperatures. The resulting light brown, dark brown, black, and blue-grey pigments were characterized using UV-Vis-NIR, XRF, and XRD spectroscopy, and subjected to sunlight for light fastness testing. Spectroscopic data was analyzed using ANOVA to identify statistically significant variables in pigment colors and trace metal concentrations.

Pigments fired above 468 degC exhibited strong lightfastness, while pigments fired at 468 degC exhibited some fading. Pigments fired at 302 degC were very fugitive, fading dramatically after two weeks of exposure to summer sun. Trace metal analysis proved useful in abstracting several key factors useful in determining the methods of a bone pigment's production: reduced strontium levels indicate bones were boiled prior to pyrolysis; very high levels of iron alongside the presence of lead and titanium indicate industrial production methods; and elevated ratios of strontium to calcium indicate pigments were washed in gum water, a method described in the 17th century by Nicholas Hilliard. NIR and UV-c reflectance data is useful in modeling the temperature to which bone samples were fired, although bones boiled prior to firing exhibit a distinctly unique temperature modeling curve compared to bones that were not boiled prior to firing.

(60) What Lies Beneath: A study of the materials and techniques of Persian lacquerwork

Claire Grech, Australian Conservation Science Fellow, Harvard Art Museums; Katherine Eremin, Patricia Cornwell Conservation Scientist, Harvard Art Museums; Narayan Khandekar, Director of the Straus Center for Conservation and Technical Studies, Director of the Center for the Technical Study of Modern Art, and Head of the Analytical Laboratory, Harvard Art Museums; Mary McWilliams, Norma Jean Calderwood Curator for Islamic and Later Indian Art, Harvard Art Museums

The materials and techniques of Persian artworks have received much study in recent decades. However, not all media have been examined in the same detail, and Persian lacquer work in particular has received little analytical study in comparison to other media. Lacquer was used to produce and decorate a range of objects, particularly pen boxes, book covers and mirror cases, from the late Timurid period onwards, reaching its height during the Qajar period (1789-1925). A recent donation to the Harvard Art Museums has facilitated an in-depth technical analysis of a large collection of Persian lacquer wares ranging in date from the early eighteenth to the early twentieth century. This study will concentrate on Isfahan and its artists, as this was the major production center for lacquer in nineteenth-century Iran, and work from this region was exported to cities throughout the country. Relatively little is known about the workshops - their materials, recipes and techniques, and the transmission of this knowledge between generations. A significant number of signed lacquer objects exist, and this has served as a basis for historians and collectors to define stylistic groups. The boundaries of these groups are not well defined, however, as similar compositions are found across the circles. Some of these designs can be traced back to earlier groups, indicating a shared artistic lineage. Some primary textual accounts exist describing the manufacture of these objects, but portray the process in quite broad terms. This study aims to

provide an understanding of the variety of materials and techniques used to construct these boxes, and investigate possible differences between earlier works and the different stylistic groups of the Qajar period. Through non-destructive examination using X-ray fluorescence spectroscopy and detailed micro-examination, the metals and pigments have been characterized and the works divided into groups on a technological and material basis as well as the more traditional art historical basis. Following the non-destructive examination, samples will be taken from selected art works for cross-sectional analysis and scanning electron microscopy to fully understand the layer structure and characterize the materials used. Fourier transform infrared spectroscopy will be used on some samples to identify the organic colorants and confirm the nature of the lacquer.

(61) Materials and Techniques of Painted Islamic Manuscripts

Katherine Eremin, Patricia Cornwell Conservation Scientist, Harvard Art Museums, Penley Knipe, Philip and Lynn Straus Conservator of Works on Paper, Harvard Art Museums, Claire Grech, Australian Conservation Science Fellow, Harvard Art Museums

An ongoing interdisciplinary study at the Harvard Art Museums aims to understand the materials and techniques used for the illumination within Islamic manuscripts. The project was initiated due to difficulties in distinguishing geographical or chronological patterns in the materials used based on existing studies. This was due in part to the relatively small number of works examined in total and in part to difficulties in attribution of works, either to a particular date or a particular town or region. The Harvard Art Museums have an extensive collection of Islamic manuscripts and folios from across the Islamic world spanning the 13th to 19th century, many of which can be assigned to a specific area and are dated. It was hence hoped that a comprehensive analytical project based on the collections at the Harvard Art Museums might help clarify our understanding of the materials and techniques used and relate these to the period and/or place of manufacture. In some instances, it was possible to examine several folios from a single manuscript to determine any variety within these. The initial phases consisted of careful examination with visible, ultraviolet and infrared radiation and detailed photography of areas of interest. Following this, non-destructive x-ray florescence (XRF) and Raman spectroscopy were undertaken in multiple areas of each manuscript. Selected areas were sampled where appropriate after discussion with the curator if the material identification remained uncertain after non-destructive analysis. Samples were analyzed by Raman spectroscopy, Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy with energy dispersive microanalysis (SEM-EDX). All colors present on each manuscript were analyzed to assess the full range of materials used.

The current project has identified a number of regional and chronological variations but further work is on-going to assess the materials used in each of the main production centers. This necessitates analysis of well dated and attributed works of art in order to build up a comprehensive database of the materials and techniques used across the Islamic world.

(62) Medieval Wax Pendant Seals: Examination, Treatment, and the Creation of Digital Surrogates

Annie Wilker, Senior Paper Conservator, Huntington Library, Art Collections, and Botanical Gardens

In Medieval England, wax pendant seals served to authenticate legal documents such as deeds. Aside from this official purpose, the iconography, design, text, and size of a seal also suggested the status of its owner. Today these seals can be used to identify and occasionally date a given record. Recently there has been great interest in the 916 deeds contained in the Battle Abbey collection of British manuscripts at the Huntington Library, Art Collections, and Botanical Gardens. Within this collection a complete monastic archive is represented, spanning the time from the birth of the abbey in the 12th century to its dissolution in 1538.

Deeds in the Battle Abbey collection were constructed using typical materials: iron gall ink on parchment with wax pendant seals. The seals themselves vary widely in style, composition, and state of preservation. Based on observation and historical research, the seals most likely consist of beeswax plus additives including colophony, calcium carbonate, and colorants such as vermilion and verdigris. Generally the seals were attached to the document by means of a cord or parchment tab and impressed with a metal matrix. Cracking, flaking, and loss are common in these inherently fragile objects; surface dirt, distortion, and color shifts were also observed. Many of the seals have been lost entirely, and others have been repaired with new wax. The seals are not well protected in their current housings.

Though the importance of addressing the Battle Abbey deeds as whole, composite objects was recognized, special attention was paid to the treatment needs of the wax pendant seals. Traditionally, pendant seals have been repaired with warm wax and solvents. Unfortunately, these techniques are not easily reversible and have the potential to soften and distort the seals. Alternative consolidants, fill materials, and application methods were sought and tested on mockups made of beeswax and colophony. Treatment methods were deemed successful if they were reversible, displayed good optical properties and adhesion, and if the repairs appeared weaker than the wax seal itself. A variety of new housing options were also assessed for this large collection of fragile medieval deeds.

To aid in the study of the pendant seals in the Battle Abbey collection, and to reduce future handling, various types of digital surrogates were investigated. Fully representing the low-relief images and text of the seals in a single image proved to be challenging. For this reason, reflectance transformation imaging (RTI) and 3D scanning were explored as alternate methods. Curators and seal researchers weighed in on the usefulness of these digital surrogates as well as the potential use of RTI and 3D viewing software in a reading room setting.

(63) Calcium Hydroxide vs. Magnesium Bicarbonate: A 25 Year Natural Aging Experiment

Betsy Palmer Eldridge, Conservator, Private Practice

In 1989 I gave four presentations on Paper Treatments for Bookbinders at the Guild of Book Workers' Annual Standards Seminar in

Portland, Oregon. In those half-day presentations, I explained and showed how to dry clean, test for acidity, wash and neutralize, light bleach, humidify and flatten book papers. Given the shortness of time, I relied a great deal on before and after demonstrations like Julia Child's cooking demonstrations. One of them was a demonstration comparing calcium hydroxide and magnesium bicarbonate, two neutralizing solutions commonly used and under much discussion at the time. I washed samples of newspaper in differing strength solutions of each and then dried them. I then mounted them on a newspaper backing to compare the results. After the presentations were over, I rolled up the newspaper pages and parked them in a forgotten corner of my bindery, subject to all the natural variances in temperature and humidity for the next 25 years. Occasionally when I checked them I was surprised by what I saw. Originally I had been a fan of the calcium hydroxide process; however the magnesium bicarbonate process indeed seemed to be holding better, with less discoloration. While there have been many examples of artificial aging experiments of the two processes, there have been few of natural aging. I would like to show these papers as a Poster so others can see what I saw, which has changed my thinking. I am now a convert to magnesium bicarbonate.

(64) Intervention Sheets: Defrosting of Documents Bound in Leather

Céline Allain; Cécile Chauveau, Art technician, National library of France; Gisel Baritello, Art technician, National library of France, BnF

The national library of France (BnF) underwent in January 2014 an important water leakage on the site François-Mitterrand, due to a pipe burst causing damages to 10 000 to 12 000 documents of the 19th and 20th centuries. Documents bound with leather were soaked and the decision to frost them has rapidly been taken in order to avoid further physical degradation such as shrunk, distortion, degradation of collagen and turning into gelatin. The following step consisted in choosing the right defrosting method in order to prevent further physical damage due to drying out too quickly or too slowly, which can cause tearing, distortion, splitting, cracking, hardening,etc..When using vacuum freeze drying the costs are higher than when using a conventional drying method, and the method and results are not easily controlled by the libraries. A slow air drying process applied to small batch sizes provided the condition of a tight control by a team of paper conservators to avoid mold grow and other side effects. Two methods have been followed: defrosting and drying in a ventilated enclosure used for the extraction of pollutants, encapsulation in air-tight enclosures with absorbent paper which have been transposed into step by step sheets of intervention that could be presented in a poster.

(65) Silica Gel to the Rescue: How to Survive a Winter Without Humidification

Adrienne Bell, Book Conservator, Folger Shakespeare Library

On December 1, 2014, the clean steam boiler at the Folger Shakespeare Library was turned on and ... promptly turned itself back off. Over the next week, Facilities ran a series of tests to determine if it was possible to resurrect the almost 40 year old piece of equipment at least long enough to get a replacement ordered and shipped. The good news: the boiler was in need of replacement anyway. The bad news: it was completely dead and a replacement would take two and a half months to order, fabricate, and install and all this was happening at the very beginning of the DC winter. The clean steam boiler at the Folger is the sole source of humidification for the 201 East Capitol St, SE building. This meant all collections storage spaces, offices, and public areas were without added humidity until such time as the new clean steam boiler could be installed. While this was problematic enough when discussing storage conditions for Folger collections materials, it became even more of a concern when the contractual obligations associated with the loan items contained in the current exhibition were taken into consideration. Once it became clear that a short term solution was not possible, the Conservation team at the Folger began closely monitoring the environment within the Exhibition Hall and within the display cases themselves. The conditions within the Exhibition Hall quickly showed the impact of the lack of humidification capabilities. Thankfully, the 12 table style display cases within the Exhibition Hall remained stable throughout the course of the outage. The 8 tall vitrine style display cases within the Exhibition Hall were unfortunately not as well sealed and began to show a decline in relative humidity in close correlation to the Exhibition Hall itself. The Folger Conservation staff implemented two different measures in response to the drier conditions. The first measure was the installation of portable humidifiers within the Exhibition Hall itself. When that proved insufficient, the decision was made to attempt to raise the relative humidity within the tall vitrine style display cases via the introduction of silica gel conditioned to higher relative humidities than those usually utilized in exhibitions. This presentation will detail how the Folger Conservation staff utilized silica gel to raise the RH within the display cases above that of the conditions within the Exhibition Hall discussing the pros and cons to this approach, what was learned along the way, and how we are applying these lessons to future exhibition planning.

(66) The Miscellany of Henry Oxinden: Or How Dental Floss, Beading Wire, and Alligator Forceps Can Be Used to Resew a Book in Situ

Adrienne Bell, Book Conservator, Folger Shakespeare Library

In November 2014, The Miscellany of Henry Oxinden arrived in the Folger Conservation Lab as part of a slew of materials needing conservation prior to inclusion in an upcoming exhibition. Immediate examination of the textblock and binding revealed several interesting issues to be considered in the conservation treatment. The spine of the stiff board vellum binding and the joints had previously been repaired via a heavy open weave fabric adhered to the interior of the binding's spine and between the vellum and the exterior of the boards. Several signatures had begun to separate from the textblock and had been reattached using a long stitch that penetrated through the spine of the binding after the spine and joints had been repaired. The sewing had continued to deteriorate throughout the textblock and was broken in several different places along with the sewing supports. The interior of the boards were covered in manuscript, including the alum-tawed supports where they were laced through the boards. When taken as a whole, the binding and textblock were

fragile and badly in need of conservation prior to being on display for three months. When taken individually, none of the areas of damage were sufficient in and of themselves to provide immediate access to the structure of the textblock or the binding. Conversations with the Curator of Manuscripts at the Folger determined that there was too much provenance information contained in the current structure to allow for the dismantling of the textblock either from the binding or into signatures in order to repair the problems that as a whole overwhelmed the manuscript. Conservation treatment somehow needed to stabilize the existing sewing structures without removing the existing sewing structure or exposing the spine of the textblock. This became the problem that the Conservation team had to tackle over the course of the next month as preparations for the upcoming exhibition continued. Head of Conservation, Renate Mesmer, and Book Conservator, Adrienne Bell, discussed a variety of approaches to the problem and ended up deciding to resew the book in situ using a plastic tool designed for flossing teeth, flexible beading wire, an awl, 14" long alligator forceps, a flashlight, and 3-ply thread. Access to the spine was provided via a few "larger" gaps in the textblock created by the weakened sewing and the deterioration of the adhesive holding the signatures together; the maximum distance between signatures allowing access to the spine was 3mm. This presentation will detail how this random assortment of tools and rather limited access to the spine was used to effectively stabilize the existing sewing structure without disturbing any of the evidence of previous treatments, structures, and uses.

(67) The Durability of Bamboo Paper -Ash Content in Paper Cooked By Different Agents

Chung, Chia-Jung, DC Student, Tokyo University of the Arts; Inaba, Masamitsu, Professor; Ph.D., Tokyo University of the Arts; Chen, Gang, Professor; Ph.D., Fudan University

The effect of cooking agents on the durability of bamboo paper (Mosochiku: Phyllostachys pubescens) is studied. Dry fermented raw bamboo fiber was cooked using caustic soda (NaOH), soda ash (Na2CO3) and lime (Ca(OH)2), the cooking rate of which decreased in that order. Physical strength of sheet cooked by caustic soda and soda ash are higher than that by lime.

Changes of physical strength by moist heat ageing at 80 degrees Celsius, 65%rh, 8 weeks are small due to the alkalinity of bamboo paper. The result is quite different in the case of kozo paper in which soda ash is better than caustic soda. This difference is due to the high ash content of fermented bamboo raw fiber.

(68) Assaying Klucel-G Recipes and Techniques in the Surface Consolidation of Tanned Leathers

Evan Knight, Associate Conservator, Boston Athenaeum

Encounters with deteriorated leathers are common for book and object conservators. It is a fairly standard practice in book conservation to consolidate the surface of deteriorated leather with a 2% w/v solution of Klucel-G in alcohol, applied multiple times by brush. Existing research regarding hydroxypropyl cellulose as a leather consolidant is well known, particularly for Klucel-G, but the literature lacks complementary notes on its use, preparation, and treatment variations.

This poster attempts to provide some insight for Klucel-G in practice by presenting data on the effects of various formulations and applications of Klucel-G on deteriorated tanned bookbinding leathers from the collection of the Boston Athenaeum. Various concentrations -- from 0.5% to 3.0% w/v -- of Klucel-G in ethanol, isopropanol, acetone, and 1:1 isopropanol and acetone, each applied by both brush and spray, will be qualitatively assayed for treatment effectiveness, associated color changes, and other considerations.

(69) Revealing Hidden Text on Botanical Specimens From 1911

Genevieve Pierce Kyle, Paper and Book Conservator, Private Conservator - The Microspatula

The goal of this treatment was to uncover obscured ink inscriptions on pressed flowers from the Princess Marthe Bibesco Collection dating from 1911. When researching this project, I could find no prior published papers dealing with inscribed botanical specimens, nor how they're treated, housed, or handled in an archive. I hope this treatment and research can further assist archives and paper labs in attending to botanical specimens in their collections. The Harry Ransom Center's Princess Marthe Bibesco Papers contain manuscripts and artifacts chronicling the life and writings of this fascinating Romanian aristocrat and author. Included with her letters are several flowers that were inscribed with ink and subsequently pressed, causing the petals to fold in on themselves obscuring the text. Upon microscopic examination of the flowers, mold was found covering the ink, which further obscured the text. Treatment involved removing the mold, humidifying and opening the pressed flowers to reveal the entirety of the text, digitizing and rehousing the artifacts to best preserve them in the collection.

(70) Curing the Cure: Treatment of a Manuscript Disinfected Post TB Exposure

Kyla Ubbink, Professional Conservator/Owner, Ubbink Book and Paper Conservation

A crumbling, 240 page manuscript exposed to tuberculosis (TB) and subsequently disinfected, was never something expected to be coming through the lab. Its treatment, as discussed in this presentation, can be likened to salvaging a manuscript post disaster; exposed to extreme conditions the artifact would have disintegrated if not treated. The disinfectant caused the ink to run and fade, the paper to turn a dark amber color, and extreme brittleness to occur; these factors all rendered the artifact illegible and unusable. Written by notable Indian academic, scientist and poet Professor Puran Singh (1881-1931); preserving the document was as important as enabling transcription and translation. The odor of the disinfectant was very strong and very familiar, reminiscent of working in open air museums and camping. Since TB is still common world wide, there is a great amount of documentation on treatment of the disease and prevention methods, but actually very little regarding disinfectants used in India during the 1930's. Research led through a plethora

of internet resources, to speaking with retired nurses and doctors, and studying out of print medical journals. Samples were sent to Queens University for testing and all logic lead to Camphor oil as the suspected culprit for the disintegration of the paper. This was purely academic knowledge, as testing its removal followed generally accepted methodology and techniques.

Pushing the disinfectant out was successfully accomplished with Ketone solvents. ATR-FTIR spectroscopy testing concluded that the majority of the disinfectant product was removed. Treatment to this point made great positive changes in the paper; however, severe mechanical damage, preventing safe handling, led to every page being washed and lined with Tengu-jo Japanese paper adhered with wheat starch paste. Further aiding the translation process, scanning and digital enhancement revealing the faded text was carried out, fulfilling all of the treatment goals.

(71) Joint Failure: Board Reattachment Decision Guide

Manise Marston, Book Conservator, Library and Archives Canada, Lynn Curry, Head Book Conservator, Library and Archives Canada, Genevieve Samson, Senior Book Conservator, Library and Archives Canada

Board reattachment is a procedure to join detached cover boards to the text block of a book using a flexible hinge. There are numerous board reattachment techniques used in the book conservation field from traditional rebacking to more modern approaches that provide a wide range of results. Selecting the most appropriate technique or combination of techniques can be challenging due to multiple factors and variables that must be considered for each book.

The results of a multi-year research and training project carried out by Library and Archives Canada book conservators is a conservation information management tool: a web based (WIKIPAGE) reference guide which expands and contributes to the body of knowledge by providing concise descriptions, execution tips, comparisons and organization of techniques by attachment type and a decision guide for selecting board reattachment options.

This decision guide is based on a selection criteria which considers the anticipated use of each volume, as well as the impact of binding particularities, the condition of materials and structural components and required resources to achieve a feasible solution. The decision making paradigm comprises three decision pillars which are organized by whether or not the covering material can be lifted from the spine and boards: fully, partial or not at all. The board reattachment techniques have been grouped into three attachment types; extend supports, spine linings and strip repair with a total of thirteen variants.

The application of these concepts have been incorporated into a functional multidimensional chart comprised of Excel spreadsheets. The selection of critical factors and features from a check list of pre-set fields will guide conservators to possible solutions by adding or eliminating options on an item by item basis.

The poster will highlight the features of the decision guide and chart for board reattachment.

(72) Illustrated Wanderings of a Canadian Soldier During the First World War: Conservation Treatment of 14 Sketchbooks

Manise Marston, Book Conservator, Library and Archives Canada; Lynn Curry, Head Book Conservator, Library and Archives Canada; Genevieve Samson, Senior Book Conservator, Library and Archives Canada

Canada's experience of the First World War was captured by officially-commissioned artists such as A.Y. Jackson and David Milne, from 1916 onwards, supported by the Canadian War Memorials Fund. However, many other artists, both amateur and professional, created vivid imagery of the world around them while busy fighting, building roads, transporting goods or providing care to others. The William Redver Stark fond at Library and Archives Canada (LAC), is a rare illustrated record of the war experience of an unofficial artist. We discovered the life of this soldier through his remarkably well-preserved drawings and watercolors bound in 14 unique, hard cover, cloth sketchbooks. Purchased by Stark during his sojourn in northern Europe between 1916 and 1918, these sketchbooks are roughly the size of a smartphone or a deck of cards. As the sketchbooks had never been repaired, they showed signs of wear including tears, losses, detached pages, pages out of order or missing, broken sewing and worn-out covers, with some covers completely detached from the text block. To determine the original orientation and sequence of the detached pages, a customized page mapping and collation document was created. Using various light sources, angles, and a microscope, a forensic examination was conducted. Each minute detail of overlapping or transferred media, (watercolor, ink or graphite), paper damage and evidence revealing particularities of the bindings was recorded and analyzed for repetitive patterns. The variety of drawing papers and cloth covering materials used in the sketchbooks, challenged conservators to develop a treatment methodology which incorporated similar techniques and materials which would be sympathetic to the original bindings. Of the 14 sketchbooks, 4 required board reattachment, 10 required full conservation treatment and 7 sketchbooks required a complete re-collation. This project, commemorating the centenary of the First World War, compelled us to be innovative in the solutions employed to conserve and restore William Redver Stark's sketchbooks to their original order, and to allow the sequence of drawings to continue to tell their story.

(73) A Comparative Study of Cotton Blotting Paper, Evolon® and Tek Wipe As Absorbent Supports for Paper Conservation Treatment

Marina Ruiz Molina, Associate Conservator, The Metropolitan Museum of Art; Amy Hughes, The Metropolitan Museum of Art

Cotton blotter paper has been traditionally used in paper conservation for a variety of treatment techniques and is ordinarily employed during blotter washing, drying, and flattening. In the past five years however, two major factors have motivated the discipline to explore alternatives to cotton blotter: the unique treatment demands of many

works of art on paper as well as the pursuit of sustainable treatment practices. An example of such unique demands are contemporary works of art on paper, which are often created on oversized supports, necessitating larger substrates for blotter washing, drying, and flattening. Furthermore, the moisture sensitivity of modern and contemporary paper supports and media present the need for new materials that allow precise control over the introduction and removal of moisture during treatment. Two products—both non-woven synthetic fabrics—have recently emerged as promising alternatives for cotton blotter in paper conservation practice: Evolon® and Tek Wipe. The incorporation of some of these new materials by conservators serves as an example of the dialog that sometimes takes place between conservation professionals and the contemporary art supply industry. This poster explores the advantages and disadvantages of each synthetic, as compared to the performance of cotton blotter, using qualitative tests performed on mock objects. Chemical and physical reactions including diffusion, capillary action, and hydrogen bonding—each integral to the performance of the fiber web during treatment—are considered. Recommendations for incorporating these fabrics into day-to-day practice will be provided in order to suggest alternatives to certain paper conservation treatments and to reduce waste and material costs.

(74) Further Research in the Conservation and Preservation of Letterpress Copybooks

Laura Dellapiana, Postgraduate Fellow in Conservation of Museum Collections, Smithsonian Institution Archives; Nora Lockshin, Senior Conservator, Smithsonian Institution Archives; Dawn V. Rogala, Paintings Conservator, Museum Conservation Institute - Smithsonian Institution

The project, completed between September-December 2015, was focused on conducting further research in the conservation and preservation of the letterpress copying books of Spencer Fullerton Baird (1823-1887 CE), belonging to the collections of the Smithsonian Institution Archives (SIA) Record Unit 53. The collection is affected by severe iron-gall ink corrosion and ink fading, which are enhanced by the particular nature of the papers and inks used for the creation of letterpress copybooks. The books document the correspondence history of the second Secretary of the Institution, covering the period from 1850 to 1877. In 2011, a previous SIA Fellow, Beth Antoine, undertook interesting studies for the conservation of the Baird letterpress volumes which were published in Book and Paper Annual 30 (2011). The current goals of this work were to identify new research questions from Antoine's conclusions and to complete new tests to expand upon non-aqueous conservation treatments with antioxidants, and develop risk assessment guidelines and treatment methods for these problematic artifacts. The project was conducted through tests on samples from, and mockups of the Baird letterpress copybooks sheets with different antioxidants, adhesives, and application techniques, to model effective workflow to stabilize the volumes for digitization in the future. In particular, two different antioxidants: tetrabutylammonium bromide, 1-Ethyl-3-methylimidazolium bromide, and five adhesives and sizing materials: gelatin, Klucel G, Tri-funori, isinglass, and the new Avanse/Plextol formula for heat-set mending tissue as presented by the National Archives & Records Administration at the 43rd annual AIC meeting were tested for practical use. The mockups were created in accordance with the historical information and studies about letterpress copybooks inks and papers available in the literature, and the research conducted in 2011 on the Baird volumes. The materials were tested for aging effects and tensile strength with the scientific support of the Smithsonian's Museum Conservation Institute. Moreover, the samples were photographed under ultraviolet light to verify their visual effect, because ultraviolet light will be useful during the digitization process for enhancement of faded inks. Particularly important for the researchers was to understand if the materials and techniques tested could be affordable and consistent with the daily practice of a conservation laboratory. Aspects such as the cost of materials, the availability of equipment, the estimating time of every proposed treatment (ink stabilization, mending, and digitization) were considered. The results of this research project will lead to a long-term conservation-digitization preparation project of the Baird volumes. Before starting the tests, an international inquiry on the conservation methods of letterpress copybooks was launched, with interested parties replying from the United States and abroad, including Australia, Greece, Slovenia and United Kingdom. Indeed, this query showed that providing solutions for these new research questions and methods are not only important for the Baird collection of the Smithsonian Institution Archives, but also for archives, libraries, and historical collections all over the world, due to the diffusion of letterpress copybooks.

(75) Silver Nanoparticle Sensors for Detecting Active Deterioration in Iron Gall Ink Drawings and Documents

Rui Chen, Senior Conservation Scientist, Aging Diagnostic Laboratory, Institute for the Preservation of Cultural Heritage, Yale University; Paul Whitmore, Director, Aging Diagnostic Laboratory, Institute for the Preservation of Cultural Heritage, Yale University; Marie-France Lemay, Paper and Photographs Conservator, Center for Preservation and Conservation, Yale University Library, Yale University

Silver nanoparticles have been shown to be promising sensors for certain reactive gases in art conservation applications. For example, it was previously reported that silver nanoparticle films can be effective replacements for silver metal coupons in the Oddy test, where they are much more sensitive and quantitative indicators of corrosive gases. They can also be used to sense the presence of reactive gases in the microenvironment within closed daguerreotype cases. The sensing response of silver nanoparticles is based on their special optical property, the localized surface plasmon resonance (LSPR) absorption, which imparts a strong color to the nanoparticles. When the silver surface reacts with gaseous compounds, the color of the nanoparticle is bleached. The reaction can be monitored by measuring the visible absorption with a spectrometer, and the reaction rate can be used to determine the concentration of the harmful gases. In this study we explore the application of silver nanoparticle sensors to examine iron gall ink drawings and documents. In this case, the sensors are not used to indicate the presence of gases that are putting the objects at risk, but rather, to detect the unstable compounds generated during active oxidative degradation reactions. A positive sensor response can thus nondestructively detect that degradation chemistry is occurring. Iron gall ink degradation usually manifests itself as deterioration of

the substrate, also called iron ink corrosion. Although the details of the destructive chemical reactions are not completely understood, it has been proposed that the redox reaction cycles between Fe2+ and Fe3+ induce the severe deterioration of the substrate by the generation of volatile peroxides and organic radicals. Silver nanoparticles can react with the volatile peroxides, and that reaction of the silver surface will also bleach the color of the nanoparticles. In this project, a set of nineteenth-century drawings and a number of manuscript letters and envelopes, all created using iron inks on paper substrates now in various states of degradation, were nondestructively examined with silver nanoparticle sensors. A decrease in the intensity of color was observed during the exposure to the ink areas on these materials, indicating that the silver nanoparticles were reacting with peroxides emitted from active oxidative deterioration of the ink and paper. This detection of active degradation will also be used on iron ink documents that have been treated to arrest the degradation. The sensor response can be used to verify effective treatment, and explore the persistence of that stabilization.

(76) Pima Cotton Hinges

Susan Peckham, Senior Paper Conservator, Library of Congress

Finding a strong resilient hinge for mounting works with fragile media is an earnest pursuit for many paper conservators. A hinging system that grew out from a conversation with Hugh Phibbs, the past Coordinator of Preservation Services at the National Gallery of Art, was expanded to mount several pastel drawings at the Library of Congress. Long strands of Pima cotton, or Extra-Long Staple (ELS) cotton, are separated from a fiber bundle, evenly dispersed in water and ethanol, and attached to strips of kozo. The strips are cut down into varying sizes of pendant hinges, which can be easily attached to the verso of works while working from the recto side. A mixture of acrylic emulsions, Lascaux 360 HV and 498 HV, applied with heat, attached the hinges to the works. The system is ideal for works that necessitate the strength of a pendant hinge, but require that the hinges be less visible. Additionally, this system was developed with transport in mind as these particular works are stored off-site. This project was completed with assistance from Library of Congress Paper Conservation Program Intern and Paper Conservation Technicians.

(77) Borane Tert-Butylamine Complex: The Effect of Rinsing on Aging Properties of Treated Paper Objects

Vincent Dion, Graduate Student, Queen's University, Alison Murray, Associate Professor, Queen's University; Rosaleen Hill, Assistant Professor, Queen's University

Paper-based objects degrade following two major mechanisms: acid-catalyzed hydrolysis and oxidation of the cellulose polymer, with both processes contributing to embrittlement and yellowing. Oxidation has not received the same attention in conservation research resulting in fewer treatment solutions to prevent and remediate it. Recent studies have pointed to borane tert-butylamine complex as a promising reagent for the stabilization of cellulose by to selectively reducing carbonyl groups formed during oxidation back to original hydroxyl groups. A resulting effect of this stabilization is a brightening of the object suggesting the complex is also a suitable agent for mild and controlled bleaching. While the reagent has informally entered the paper conservator's toolbox, especially due to its compatibility with gellan gum rigid gels, the conservation literature lacks an agreed upon range directives for carrying out the treatment. The study examined the long-term effect of residual reagent remaining in treated paper samples. Accelerated thermal ageing was performed on rinsed and unrinsed samples treated with different concentrations of the reagent and changes were monitored using colorimetry based on the CIE L*a*b* colour space, TAPPI T 509 pH measurements, Fourier transform infrared spectroscopy and zero span tensile strength testing. The authors report on the importance of the rinsing step after treatment and the possible advantages of leaving objects unrinsed. This work provides important information for conservators regarding the usage of the reagent with safety for the object and themselves.

(78) Storage of Architectural Materials – An Alternative for Rolled Drawings

William Minter, Senior Book Conservator, Penn State University

Storage of architectural drawings is a challenge for libraries. In most cases, due to the size and the large number of drawings, these items must be rolled for economy and efficiency. Over the years, various systems have been devised where the drawings are supported on a small tube that is housed within a larger tube. Such honeycomb systems can be efficient, however, we were faced with the need to re-house a large number of drawings within a limited budget. As in all cases, the storage materials should be acid-free for long-term preservation.

Since large diameter, acid-free tubes exceeded our budget, we looked at alternative materials. Initially, lightweight aluminum tubes were made and even Coroplast boxes were examined. In the end, we worked with standard acid-free corrugated board. While this material may seem obvious, we utilized an assembly technique commonly found in some modern skyscrapers.

After the corrugated board was cut and scored, it was assembled as an open-ended box. Then a number of these boxes were glued together forming a sturdy, structural unit. These units were then stored on standard metal shelving. In our case, we made these honeycomb units two boxes wide and six boxes high. The resulting system reduced the cost to about a third of a common system while meeting our criteria of acid-free storage.

(79) Bone Folders for Book and Paper Conservation: An In-Depth Examination

William Minter, Senior Book Conservator, Penn State University; Olivia Kuzio, Student, Penn State University

Natural bone folders have been used for centuries by bookbinders. Today, in addition to bone, Teflon and other synthetic materials are gaining favor among book and paper conservators. Conservators who were trained as an apprentice often learned the practice of soaking a natural bone folder in oil, wrapping it in cloth, letting it

stand and then wiping away the oil before using the folder. Typically, after the oil has been wiped away, a natural bone folder seems to have better, more desirable slip when folding paper.

In 2013, there was a concern about this practice expressed on a discussion forum in the Book Arts List hosted by Syracuse University and managed by Peter Verheyen. The discussion cites a statement in the book, A Degree of Mastery: A Journey through Book Arts Apprenticeship (1999) by Annie Wilcox, in which Wilcox endorses this practice of soaking bone folders in oil—a practice she learned from her mentor, Bill Anthony. The discussion then raises the concern that after it has been soaked and wiped clean, there may still be residual oil on the bone folder that could be deposited on paper.

Our research here at Penn State University will be two-fold. First, we will examine bone folders in order to determine whether they are physically able to act as a vehicle for the transfer of oily residue. In collaboration with the Penn State Material Sciences program, we will examine both the natural and synthetic materials used to make bone folders using microscopic imaging and hardness evaluations. Then, we will collaborate with the Penn State Forensic Chemistry program to apply forensic techniques commonly used during crime scene investigations to this conservation context. The techniques, which are typically used to detect and visualize residual oils in latent fingerprints, are iodine fuming, silver nitrate exposure and/or ninhydrin solution treatment. Applying these treatments to paper following the use of an oil-soaked bone folder should be useful in examining whether any residue is transferred to paper.

With these examinations, we will gain a better understanding of the various materials used to make bone folders, as well as the safeness of the practice of soaking bone folders in oil.

(80) A Case for the Proclamation of the Constitution: Access and Preservation of Prestige Documents

Michael Smith, Collection Manager, Textual and Cartographic, unpublished & unbound, Library and Archives Canada

Balancing the needs of clients with the long term preservation requirements of prestigious archival records is a delicate act that comes with several challenges. In many cases, the demand for access to important archival material in the form of on-site consultation or loans to other institutions requires careful consideration and negotiation in order to mitigate risks of damage to the document while at the same time ensuring access. This poster will highlight the goals and the challenges associated with designing and building a preservation case for two of Library and Archives Canada's most important documents, the 'raindrop' copy of the Proclamation of the Constitution of Canada and the previously vandalized 'red stain' copy. Emphasis will be made on the challenge of addressing the needs of users (public access to this prestige document) with that of the long term preservation of the material (slowing deterioration of the signature inks by reducing harmful light exposure).

(81) The Use of a Laser Level in Creating Cushioning for the Transport of Objects

Denis Plourde, Adjoint, Restauration 2-D, Musée McCord

This poster presents an accurate, rapid and inexpensive packing method that uses a laser level in the fabrication of cushioning materials suitable for fragile or complex objects. This technique can be used with the system of double case packing developed by Paul Marcon of the Canadian Conservation Institute. Objectives: Handling and transport are among the main agents of the deterioration of objects. Friction, shock and vibration should be avoided during all handling operations. Some objects are particularly susceptible to deterioration due to being touched; others are vulnerable to breakage when subjected to sudden shocks. This is certainly true of objects whose unusual shape (for example with components that extend beyond the body of the object) renders them more prone to damage. Because the object is in direct contact with the packing material, it is necessary to minimize its movement as much as possible, to reduce abrasion caused by vibration or breakage due to shock. Proper cushioning and double packaging can prevent this damage.

There are several advantages to the use of a laser level. It rapidly and accurately traces the outline of an object and can facilitate the breakdown of multi-faceted shapes into complex profiles. It can also be used for large or small objects. However, the workspace has to be large enough to allow enough distance between the laser and the object and attention must be paid to the angle of projection to avoid deformation in the shape of the beam.

Materials used: Required are the object to be reproduced, a laser level (horizontal or vertical), a sliding column (photo copy stand), a transparent Plexiglas® sheet (held in place vertically), a sheet of paper, a magnet and a metal rod. Approach: The laser level beam reproduces the exact shape of the object by tracing the front profile and a side profile, perpendicular to it, from which are produced two cutouts in an appropriate foam. This results in two forms: a negative shape that will be used to cushion the object, and a positive form which can be used to modify the shape of the cushioning, if necessary.

The object used as an example in this poster is a small Inuit doll with an ivory head, dressed in caribou and hare fur, measuring (H) 23.3 cm x (W) 10.8 cm x (D) 4.5. Handling this object must be kept to a minimum due to the potential loss of hair. Fortunately, we were able to use the display support as additional support for the object during transport.

Conclusion: Widely available and easy to use, the laser level proves to be an excellent tool to trace the shape of complex objects to obtain accurate cushioning forms for packing. The use of the laser minimizes handling of the object during packing and ensures the best protection for the object during transport.

(82) Conservation Issues of a Mass Digitization Project

Rachel Greenberg, Mass Digitization Project Objects Conservator, Cooper Hewitt Smithsonian Design Museum

Many museums are currently undertaking mass digitization projects. With a very small percentage of the collection on display in the galleries, digitization provides access to a wider public audience than could ever access the physical objects. Such projects allow collections to be accessed remotely by curators and researchers, reducing perpetual handling of the collection. This is great for fragile and sensitive objects that risk being damaged each time they are accessed. While there are many positive aspects of a mass digitization project, there are also

conservation issues that must be addressed before taking on such a project. Working as the project conservator for the Mass Digitization Project at the Cooper Hewitt Smithsonian Design Museum has given me the opportunity to realize many more conservation issues than originally expected. While conservators working on digitization projects in some museums are focused on conservation treatments to ensure a visually pleasing object, this encompassed the smallest part of the project at Cooper Hewitt. The main objective of the conservation aspect of the project was focused on insuring the safety of the objects during the rapid capture project. In order to digitize the entire collection, a large number of objects have to be photographed each day. The collection was given throughput rates based on handling and transportation requirements of different types of objects, ranging from 70 – 250 objects photographed each day. With such a large number of objects being handled each day, there were many possibilities for safety issues to arise. Most museums are hiring specialized companies to complete the mass digitization project. This means that the staff is not necessarily aware of the conservation issues of the collection. Preplanning by museum conservators is important, and should cover some of the following issues:

- Carefully attaching barcode tags to each object in order to be scanned and digitized in the database.
- Assessing object housing with the photography schedule to reduce objects being moved multiple times unnecessarily.
- Planning packing and moving of objects from storage to the photography studio.
- Condition assessing the collection to determine if the objects are stable enough to be handled by the contracted art handlers or if they need more specialized handling from a conservator.
- Determining if objects are too difficult to move or too fragile to participate in the rapid capture project.

This poster will discuss these and other conservation issues that conservators should be aware of to ensure object safety during a mass digitization project.

(83) Let There Be (Less) Light! A Comparison of the Radiation-Blocking Properties of Selected Window Films

Saira Haqqi, Andrew W. Mellon Fellow in Library and Archives Conservation, Conservation Center, Institute of Fine Arts, NYU; Steven Weintraub, Institute Lecturer, Conservation Center, Institute of Fine Arts, NYU

It is well known that visible light and ultraviolet radiation damage cultural heritage materials, especially those incorporating organic colorants, such as manuscript pages. While reducing the amount of visible light can negatively interfere with the viewing experience, ultraviolet radiation is not detectable by the human eye. Its removal, therefore, can only be considered beneficial. Since daylight has a high ultraviolet content, it is essential to filter out the ultraviolet (UV) component within an exhibition setting. There is a wide range of window treatment options with UV filtering properties on the market, including special types of window glass and window films. Most are not designed specifically with cultural heritage collections in mind. Since these window treatments do not just remove UV radiation, but also might reduce the amount of visible light entering the galleries and alter the visible spectrum of daylight, it is important to understand the full consequences of such solutions.

This research examines a number of UV-filtering window films, in order to determine the extent to which they reduce both UV radiation and visible light, and to characterize how the spectrum is modified as light passes through them. It compares three different methods of evaluating window films (an ELSEC 764 environmental monitor, an OceanOptics USB2000+ spectrophotometer, and a Konica Minolta Color Meter II) and explains the differences between each assessment option. The experimental results will be compared to data supplied by the manufacturers. Since window films are designed for a variety of purposes, it is important to understand how to characterize their features and which method best measures specific film attributes. The data thus gathered allows cultural institutions to make informed decisions about which UV-blocking window film best serves their needs. This paper grew out of research conducted as part of the Preventive Conservation course at the Conservation Center of the Institute of Fine Arts at New York University (NYU). It was sponsored by NYU, the National Endowment for the Humanities, and the Andrew W. Mellon Foundation.

(84) Mixing It Up: An Investigation into Low-Tech Methods for Reconditioning Silica Gel

Steven Weintraub, Owner, Art Preservation Services; Rebecca Gridley, Lisa and Bernard Selz Fellow, The Conservation Center at the Institute of Fine Arts, New York University

This poster will present experiments with simple 'low-tech' methods for reconditioning silica gel to a desired relative humidity (RH) value for use in exhibition cases and storage enclosures. Controlling RH can be the most challenging part of maintaining safe and stable environmental conditions for a collection, and loan agreements for sensitive objects often dictate tight parameters for RH levels. Silica gel is the most common component in passive systems used to buffer RH in various types of microclimates. Silica gel must be conditioned to ensure it has buffering capacity to maintain RH levels within the desired range. Depending on exposure duration, leakage rate, and environmental conditions outside the enclosure, silica gel will drift out of its set range of RH over time. The moisture content of silica gel can be brought back to a desired value instead of replacing the material. Published methods for reconditioning large quantities of silica gel require specific equipment, laboratory conditions, or large spaces with tight environmental controls. As a result, museums and institutions have to acquire and maintain specialized equipment, have staff dedicated to this task, or rely on outside vendors. Often a replacement batch of silica gel—preconditioned to the desired RH by a supplier—is purchased to avoid the hassle. This can be expensive and unnecessarily adds to the institution's existing stock of still-usable silica gel.

The authors' experiments respond to the need for simple procedures that would allow collections care professionals to recondition silica gel 'in-house'. The procedures employed made use of widely available and relatively inexpensive equipment and aimed to simulate real world scenarios on a smaller scale. The experiments tested whether it is possible to effectively recondition silica gel with silica gel — that is, reconditioning by mixing silica gels with different initial RH values to obtain a desired RH value. The process of reconditioning was modified to explore the influence of

specific parameters, such as the buffering capacity of different types of silica gel (regular density versus high performance gel), time required for the silica gel to reach the desired RH range, and time required for equilibration within that range. Progress was assessed using both qualitative and quantitative methods, including monitoring the rate and pattern of change with color-indicating silica gel, measuring RH shifts with dataloggers, and calculating weight changes. The poster will describe the experimental procedure and results, evaluate the efficacy of methods and equipment used, and discuss potential applications within the museum context. Simplified methods for reconditioning silica gel will provide a valuable tool for creating and maintaining RH controlled microclimates at a time when the museum community is moving toward the acceptance of wider RH macroclimate ranges for collections on exhibition and in storage. This project was part of the Preventive Conservation course at The Conservation Center at the Institute of Fine Arts, New York University (NYU). This study was sponsored by NYU, the National Endowment for the Humanities (NEH) and Lisa and Bernard Selz.

(85) How to Prioritize Your Collections Without Losing Your Mind: A New Tool for Emergency Planning

Tara Kennedy, Preservation Services Librarian, Yale University Library

Creating collections priorities for cultural institutions can be an immense challenge. There are many considerations that need to be addressed when mapping out collection locations in case of an emergency, and often it is a daunting task that leave many conservators scratching their head. This simple tool - using an Excel spreadsheet and a series of "Yes/No" questions - allows the preservation professional to prioritize their institution's collections from highest to lowest priority in a quantitative, impartial fashion.

(86) Development of Descriptive Terminology for Inkjet-Printed Photographs and Fine Art

Daniel Burge, Senior Research Scientist, Image Permanence Institute

The purpose of this project was to develop the descriptive terminology for inkjet-printed photographs and fine art prints in cultural collections necessary for accurate object understanding and preservation. Inaccurate or imprecise descriptions put objects at risk for inadequate or even harmful care. Research into the permanence and preservation of inkjet prints has shown that the various subtypes of inkjet have significant variations in their responses to the environment, handling, and display and as such have unique and sometimes potentially contradictory preservation needs. Unfortunately, there is currently no single approach to describing variations in inkjet prints for conservation that has become generally accepted, though several have been suggested including those recommended by Martin Jürgens and Wilhelm Imaging Research. This work will be invaluable to anyone, either directly or indirectly, involved with collections' stewardship within cultural heritage institutions: collection managers, curators, conservators, registrars, catalogers, exhibition preparators, etc. This is a rather diverse group and each position intersects care activities from a different vantage point. An accurate, precise, and mutually agreed upon terminology will increase the chance of consistent and effective care. In addition, institutions must interact with individuals and organizations outside their own confines in ways that also maximize chances for good object care including artists, galleries, auction houses as well as the staff of other institutions during the loan process to ensure that all parties understand clearly what each object is and how it should be handled, transported, and displayed.

The approach to addressing this problem was broken down into a series of steps: development of a set of criteria to appraise prospective description approaches, collection of existing descriptive systems from the literature with comparison to the established criteria, and selection of the best system or the best features from each upon which to create a new system. While none of the existing systems met all of the criteria, each of those reviewed clearly had strengths that could contribute to a new combined system. A final terminology and descriptive approach was then developed. In the new system, the single primary term "inkjet" is followed by a sequence of four standard qualifiers (colorant, vehicle, ink receiver, and support) that provide a complete picture of the material which can be used as a reliable guide to understanding and preservation of the object. The new system is easy to explain and should be readily adoptable into existing naming conventions, such as that recently published by the Philadelphia Museum of Art.

(87) Preserving and Digitizing Andrew J. Russell's Collodion Glass Plate Negatives

Debra A. Peterson, Registrar and Digital Asset Manager, Private Practice; Steven Sciscenti, Collections Preparator, Oakland Museum of California

19th century photographer Andrew J. Russell is best known for his work documenting the construction of the Union Pacific Railroad in 1868 and 1869. This paper will outline the preservation and digitization of 645 of Russell's original collodion glass plate negatives, including the iconic image East and West Shaking Hands at the Laying of Last Rail.

At the start of the project, the majority of the glass plates were housed vertically in cramped filing cabinets. Thirty plates were broken, and during the course of inventory and condition review, 55 additional plates were identified with condition issues or old repairs that required special housing. Custom archival boxes and mounts were developed to insure the stability of the collodion plates in long-term climate controlled storage.

By combining re-housing with digitization, Russell's images were made digitally accessible to a wide audience while limiting physical handling of the fragile glass plates. Construction of transparent scan mounts allowed for safe handling and high-resolution image capture of reflective and transmissive images for each negative. Technical aspects of image capture were investigated alongside aesthetic questions around the final presentation of the negatives. The resulting digital images allow the viewer to experience the atmosphere of the time and place as well as show evidence of the photographer's process.

(88) Sheer Practicality: A Multi-Purpose Conservation Mount for Paper Negatives

Lénia Fernandes, Junior Photograph Conservator, Rijksmuseum Amsterdam

Paper negatives held in cultural institutions around the world are cherished as some of the earliest photographic objects in their collections. Although the process became obsolete by the mid-1860s, it is nonetheless of great relevance, as it is evidence of the infancy of photography and of the great technological developments it has since undergone. As the name implies, a sheet of paper was used as the support; a solution of silver salts would record light on its surface. The first process to patent such a method was the calotype, by Fox Talbot in 1841. In its description, Talbot mentions the option of applying a finishing coat of beeswax. Ten years later, Gustave Le Gray improved the technique and made it simpler to practice. The thin paper was prepared with wax before applying the silver solution, turning it into a translucent support. Better image quality would be obtained, in both the negatives and the corresponding positive prints: image-forming silver particles were more likely to remain on the surface of the paper, therefore having a sharper appearance. When necessary, different media, such as gouache or graphite, could be applied to retouch negatives. These delicate objects are prone to mechanical damage from handling, often resulting in creases and tears along the edges. This propensity is more noticeable on waxed paper negatives: folds or indentations become opaque in the damaged areas. The waxed surfaces have a natural tendency to yellow irreversibly, through oxidation. Retouched negatives tend to be more vulnerable, depending on the applied media's characteristics. The Rijksmuseum Amsterdam holds a small collection of nineteenth-century paper negatives, attributed to Charles Nègre, Félix Teynard, Fox Talbot and others. Sixteen of them were exhibited with other period objects created between the 1840s and 1860s in the temporary exhibition "Chiaroscuro in Photography" (February to May 2015). Their housing was re-evaluated and compared to other conservation mount examples for paper negatives found in literature. The conservation mounting folder for paper negatives had to be adjusted to the museum's specifications. To avoid renewed mounting and direct use of the negatives, the mount should ideally be mounted in conservation-grade materials, allow appropriate handling conditions, provide suitable storage, enable access to both sides of the object, adapt for viewing through transmitted light and be ready for display in the museum's Print Study Room and in exhibitions. An enclosure that meets these prerequisites and that is adjustable to the individual characteristics of each object was designed. It features a protective core for negatives, which are previously inlayed in Japanese paper, using the strip inlaying method. The core is composed of acid-free, archival quality cardboard window mats, combined with a thin sheet of colorless polymethyl acrylate (Perspex®) to support the negative. The negative is externally protected by a foldable cardboard cover, which can be removed if necessary. The model has the potential to be adapted to other objects with similar storage and viewing needs that are spread in numerous collections worldwide, promoting their preservation, display, and accessibility.

(89) Light Sensitivity of Inuit Prints from Cape Dorset: Colour Monitoring and Microfade Testing

Rebecca Latourell, Preventive Conservation Technician - Mixed Collections, Canadian Museum of History; Laura Hashimoto; Season Tse, Senior Conservation Scientist (Chemist), Canadian Conservation Institute

In 2009, during the planning of the Canadian Museum of History (CMH, formerly Canadian Museum of Civilization) travelling exhibition "Inuit Prints: Japanese Inspiration," the light sensitivities of the Cape Dorset prints included for display were noted as an area of concern. In order to quantify any colour change, as a result of light damage during the exhibition, colour monitoring was used. A series of colour measurements were taken on a selection of nine prints in early 2010, and again in 2015, after a 5-year tour. The results illustrated that several prints had measurable colour changes. While colour monitoring can quantify light damage after it has occurred, it is not able to help us predict the effects of irreversible light damage if some of the colourants are light sensitive. Microfade testing has been used at the Canadian Conservation Institute (CCI), since 2008, to identify highly light sensitive colourants in objects. In 2010, the CCI assembled their first portable microfade tester for testing onsite.

The same nine prints that had previously undergone colour measurement were tested using the portable tester at the CMH. The results identified two out of the nine prints that have some highly light sensitive colourants. "Inuit Prints: Japanese Inspiration" went ahead with standard lighting conditions for a show of its nature, but the information collected through microfade testing and the colour measurement results will be used to inform the display requirements for future shows. Combining predictive information with measured data will enable preventive measures such as shorter exhibit durations and lower light levels to be put in place. This poster illustrates the results of colour monitoring and microfade testing, and how the two techniques can be used to manage light damage.

(90) eTerminology/ie eBook for Conservators of Photographic Materials

Tania Passafiume, Head Conservator of Photographic Materials, Library and Archives Canada; Tom Thompson, Multimedia Specialist, Online Content Division, Library and Archives Canada; Anne Cartier-Bresson, Conservatrice générale du Patrimoine Directrice, Atelier de Restauration et de Conservation des Photographies de la Ville de Paris

Poster Session Abstract Library and Archives Canada (LAC) and l'Atelier de Restauration et de Conservation des Photographies de la Ville de Paris (ARCP) have partnered to create the first English-French visual glossary of photo conservation terms, in eBook format. ETerminology/ie is an eBook that contains bilingual definitions of photographic processes, alterations, and conservation treatments. This eBook will contain commonly used terms, which will be briefly defined and illustrated with photographs and/or videos. The target audience for the eTerminology/ie eBook is conservation professionals, teachers, students and interns, and anyone interested in the field of photo conservation. It could also be used by other institutions that lack an onsite Photograph Conservator. The eBook will

allow for an improved dialogue between conservation professionals and will aid in the interpretation of Condition Reports. It will also be of interest to professional and amateur photographers, as well as for people who are generally interested in the technical aspects of photography. There will be a hyperlink with each image that links the particular item to either LAC or City of Paris collections data bases, for additional information regarding that specific collection material. The eTerminology/ie eBook will be free on iTunes, and located on the LAC website. The Poster Session will include a poster which will provide examples of the three aspects of eTerminology/ie: Photographic Processes, Alteration and Conservation Terms. Demonstrations will be provided with ipads, which will illustrate the multi-purpose use of this eBook.

(91) Study for Approaching Mold Problems on Photographic Materials Using Antifungal Agent and Enzyme Sheet

Yoko Shiraiwa, Paper and photograph conservator in private practice; Takako Yamaguchi, Conservation Scientist, Tokyo Metropolitan Museum of Photography, Japan

Japan experienced an unprecedented disaster in 2011, the Great East Japan Earthquake and Tsunami. As the very difficult recovery of photographs from the unimaginably vast amount of wreckage occurred, microbial deterioration in tsunami-damaged materials presented a serious problem. This is a continued research on an antifungal agent, Hokucide® R-150; an aqueous solution of chloromethylisothiazolinone and methylisothiazolinone to be used in an emergency response procedure, as a new approach to fungal problems concerning photographic materials. (The authors have presented the topic at AIC annual meeting in San Francisco, 2013).

The study continues to investigate the effectiveness of the agent at preventing mold as well as how safe it is to use on photographs by testing photographic samples including accelerated aging. In our previous presentation we have concluded that this could be an alternative method to be used where freezing and drying may be difficult to conduct just after the disaster. For this presentation, we have further investigated the use of alcohol in the solution instead of surfactants which are more difficult to obtain during emergencies to confirm antifungal effect. Films were added in the tested samples to see its effect.

In the second part of this presentation, the possibility of using enzyme filter sheet was considered against fungal problems. The product is widely used as filters in air conditioning system in food industry and hospital clean rooms. Its primary function is to kill airborne microorganisms caught on its surface to protect against secondary contamination from air filtration systems. As immobilized enzyme on the sheet will not be consumed under enzymatic reaction, a long term effect of the enzyme is provided in preventing growth of bacteria by dissolving the cell membrane and fungi by deactivating the hyphae. P.A.T. on the product was conducted and tests with photographic samples were carried out to investigate its effectiveness, how it can prevent and suppress fungal contamination on photographic materials.

(92) Buddhist Diaspora Preservation Training: Expect the Unexpected

Ann Shaftel, Project Director and Founder, Treasure Caretaker Training, Digital Monastery Project

Treasure Caretaker Training: Digital Monastery Project, trains caretakers of Buddhist tangible cultural heritage to protect the sacred art in their own monasteries. In our sessions, participants learn to enact digital documentation on their own smartphones, learn risk assessment and emergency preparedness, and learn video interview techniques to insure the remembered history of religious and cultural treasures is not lost with the death of their community elders. These video interview files are then integrated into the digital inventory. The resulting digital inventory of Buddhist art assets can be completely confidential, as the work is done "in house" by monks and nuns who live in the monasteries. Confidentiality is often demanded by monasteries and our military participants.

The design of the training is straightforward, yet it adapts to the culture of the host country, and to the needs of each session's participants. After the training session concludes, the teaching team is available via site visits and by phone/email to help participants implement digital documentation and address their local preservation concerns. Teaching teams change according to course content, funding parameters, and visa requirements and foreign worker rules of host countries. For example, one session has requested a Buddhist-only team. Treasure Caretaker Training won the prestigious international Digital Empowerment Foundation award, and the ENorthEast award for innovative use of ETechnology in cultural heritage preservation. The first workshop session was held in Sikkim in 2014. Participants included museum and archival staff, Indian government culture officials, Indian army members, traditional artists, and university scholars, along with Buddhist monks and nuns. The second session took place in Bhutan in May/June of 2015, in association with the Royal Government of Bhutan, and UNESCO Delhi. It directly followed the major earthquake in neighboring Nepal, and "Fail to Plan – Plan to Fail" was emphasized. Sikkim and Bhutan, as well as Nepal, in fact the entire Himalayan region and other sectors of the Buddhist diaspora, have frequent earthquake events ranging from tremors to severe.

The National Museum of India invited Treasure Caretaker Training Director Ann Shaftel to teach in the Conservation Department in February of 2016. This was followed by a preservation training session for Buddhist nuns held in Bodhgaya at the Kagyu Monlam. The Government of India invited Treasure Caretaker Training to present a preservation workshop in Sikkim in March 2016 for monks and nuns. Also in 2016, Ann Shaftel and team members are working with Buddhist monasteries and foundations in Nepal, universities in Canada and the USA, and are invited by the Royal Government of Bhutan to train Cultural Officers.

(93) Teaching Conservation in Iran

Behrooz Salimnejad, The Elaine S. Harrington Senior Conservator of Furniture and Woodwork, Philadelphia Museum of Art

There has been much focus in the news on the horrific destruction of monuments and other cultural artifacts in the Middle East, including those by ISIS in Syria and the Taliban in Afghanistan.

Iran has several well established and respected conservation training programs to safeguard and preserve their artistic and cultural heritage. Collectively, these programs graduate dozens of conservators each year. Behrooz Salimnejad, the Senior Conservator of Furniture and Woodwork at the Philadelphia Museum of Art, has given several workshops at Isfahan University and Tabriz University of Islamic Arts and will describe these programs, their facilities, and his experiences interacting with students, faculty and administrators.

(94) Achieving Cultural Heritage Preservation Through Professional Partnership

Brandon Bristor, Student Learning Fellow, University of Delaware, Disaster Research Center, Megan Hewitt, Summer Learning Fellow, University of Delaware, Disaster Research Center

During disasters, historic and culturally meaningful locations have served local communities as a rallying point and source of resilience. This project attempts to aid organizations that contain collections of cultural value, such as those found in museums and libraries, in mitigating disaster impacts and planning for preparedness, response, and recovery. The Preservation Planning Alliance pools resources and experience to provide cultural institutions with guidance by identifying individual needs and creating attainable goals in order to better prepare organizations for disasters. Through this partnership, we identified specific gaps within an organization through a risk assessment. By identifying these shortcomings, we completed a number of projects that will benefit the organization specifically and serve as a critical resource to other cultural institutions. We are hopeful that the completion of these projects will further educate a variety of culturally valuable locations about disaster preparedness pertaining to their collections.

(95) 50 Shades of Yellowback

Allison Brewer, 2015 Ringle Summer Conservation Intern, University of Kansas Libraries

Captain Dangerous, A Brother to Dragons, Romance of the Seas, and Somebody Else's Wife: The History of a Heartless Woman! These titles and more are found at the Spencer Research Library on the University of Kansas Campus. Deep within the Spencer's stacks is a series of shelves filled with a set of 459 volumes with eye-catching bindings of a style of book called the yellowback. Yellowbacks were a type of book printed from the 1840s through the early 1900s. They were often sold at railway stations. Much like the paperbacks we buy in the airport today, these mass-produced books were purchased by those boarding trains seeking entertainment during their travels. This cheap literature for the masses was produced in an equally cheap manner. Straw boards were covered in a glazed paper—usually, though not always, yellow in color—and the textblock constructed of roughly sewn or stapled, lower-quality paper. Although inexpensive in production, these books were not lacking in decorative creativity. Publishing companies hired artists to create tri-colored wood-block printed covers that correlated to the stories' subject matter. The back cover, and front and back endpapers were often printed with advertisements. The inexpensive production methods of yellowbacks might have proved profitable for publishing companies, but in terms of longevity for the books such poor construction came at a cost. After years of use, many had loose or detached boards and spines, split hinges, abraded and flaking covers, and detached corners. It also appeared that some of the books had undergone previous conservation treatment involving a hide-glue to reattach boards and spines. Over time, this treatment had proven to be more injurious than helpful.

An in-depth survey of the 459 volume collection was conducted during the summer of 2015. The most common problems included abraded covers, partially detached and detached covers, detached corners, split and loose hinges, and extra adhesive in the hinge area. Of those surveyed, thirty-five books were determined to be the most in need of treatment due to their deteriorated state. Typical treatments involved reinforcing hinges with Japanese tissue, replacing spine linings with dyed Japanese paper, and consolidating corners with PVA and clamps. After treatment, a custom-fitted Mylar wrapper was made for each volume for added protection. The treatments performed were minimally invasive. It was important to keep in mind that the "cure" could not be more than the book could handle, and also that the treatments not be visually distracting. These simple but sturdy fixes extend the life span of these books and allow for easier patron.

This presentation will focus on the history of yellowbacks, the condition survey, and streamlined treatment for a collection of similar items.

(96) A Conservation Records Network (ACORN): Conservation Documentation at the Weissman Preservation Center, Harvard University

Debra Cuoco, Paper Conservator for Special Collections, Weissman Preservation Center, Harvard Library

Item seven of the AIC Code of Ethics states, "The conservation professional shall document examination, scientific investigation, and treatment by creating permanent records and reports." Conservation labs have struggled to design the best method possible to document their work and make it accessible for future generations. The Weissman Preservation Center (WPC) created a database to facilitate treatment documentation for the conservation lab. WPC treats special collections library and archive materials from the 70+ libraries that are part of Harvard University and includes millions of rare books, manuscripts, and photographs. ACORN (A Conservation Records Network) is a MySQL database with a web-based user interface. ACORN was designed for two main purposes; to track object's movement in and out of the lab, and to house written documentation. It has evolved to meet the preservation activities of a large staff with duties across the university. In addition to the registrarial function, ACORN is a repository for written and visual documentation including treatment proposals, reports, digital images, surveys, or other files. An email communication system stores conversations between conservators and collections staff and allows collection managers to approve or deny treatment requests. Non-treatment activities can also be recorded in a separate module. This can include exhibit prep, consultations, environmental monitoring or any activity that is appropriate. The database structure is simple to use and has the flexibility and versatility to work on single items, batch treatments

or large projects. Changes to field values are easy to implement. A built-in search engine makes information retrieval simple and can facilitate the gathering of statistics, whether it is the treatment hours for a specific object, the completed work for a project with multiple objects or activities, or how much time was spent consulting on environmental needs in a given year. As a web-based system, ACORN allows Harvard Library users to access the data at various locations and is a sustainable paperless system. This poster will illuminate how the Weissman Preservation Center has developed a system of documenting preservation work ranging from simple to highly complex; making it suitable for all types of conservation labs.

(97) Building Community: AIC Emerging Conservation Professionals Network Regional Liaisons

Alexa Beller

This collaborative poster from AIC's Emerging Conservation Professionals Network (ECPN) highlights on-going work aimed to foster local conservation communities led by designated Regional Liaisons. Founded in 2008, ECPN focuses on providing resources and programming that enhance the professional development of pre-program candidates, graduate students, and early-career conservators. The ECPN Regional Liaisons are volunteers who have committed to building their local communities by organizing events and to support one another throughout the beginning stages of their careers. Regional Liaisons also act as a link between ECPN officers and their local networks to distribute announcements and other information. By creating this community, Liaisons bring conservators together, facilitate learning, and promote awareness of the larger preservation field. ECPN is currently represented by Liaisons in eighteen cities across the United States: from Los Angeles to Boston, and Minneapolis to Houston. This poster highlights events and programs organized by Regional Liaisons throughout the country. The events have included portfolio review sessions, conservation lab tours, happy hours, museum field trips, and participation in initiatives such as the Artist Research Project lead by Voices in Contemporary Art. Many events welcome established conservators to help build a broader conservation community and encourage the development of mentor-mentee relationships.

(98) Reanimation of a Room-Filling Modern Art Installation: Challenges in the Conservation of Michael Buthe's 'Taufkapelle Mit Papa Und Mama'

Sjoukje van der Laan, Conservator of Modern and Contemporary Art, University of Amsterdam; Katrien Blancheart, Researcher, S.M.A.K., Marieke Verboven, Contemporary painting conservator, S.M.A.K.

This paper presents the major research and conservation project of the modern room filling art installation, Taufkapelle mit Papa und Mama (1983/1984, collection: S.M.A.K., Ghent) by the German artist Michael Buthe (1944 – 1994). Buthe's oeuvre is known for his impulsive and extravagant in-situ art installations full of symbolic, historic and autobiographic elements. The historic value of Taufkapelle is inestimable because it is one out of only two residual art installations by Buthe. Taufkapelle consists of eleven different parts, each consisting of diverse materials. Beeswax, various paints, flower petals, charcoal, furniture, wood stumps, screens, lightbulbs, eggshells, etc. are combined, painted and assembled into an immersive and complex art installation.

Many materials showed traces of their history due to handling, degradation and interaction. The condition of several parts of Taufkapelle were in such a critical state that the entire artwork could not be installed without receiving serious treatment. It was for this reason that in 2014 a major condition check and succeeding conservation treatment was implemented. During this project, two different dilemmas were discussed:

1. Concept and artist intent. Due to the lack of written documents, the authenticity, concept and the artist intent of Taufkapelle is partly lost. This is also because of the early death of the artist. What steps and approach were needed for bringing the concepts and the intentions back into the installation while the artist is not present anymore?
2. Materiality. Because of the variability of unusual and non-traditional materials, a diversity of conservation issues and dilemmas were discovered. These issues all needed attention to avoid further decay and to guarantee stable installation of the artwork in the future. What sort of approaches need to be followed when the contemporary art conservator deals with major restoration issues in a short amount of time? And how is balance found between the necessary – and sometimes controversial alterations – and conservations existing code of ethics and issues of authenticity?

The conservation of Taufkapelle required an interventionist's approach and resulted in close collaboration between the curator, art historian, art handler and conservator. The project was been divided in four main parts:

1. art historical research to the (installation) history, concept and artist's intent of Taufkapelle mit Papa und Mama,
2. an extensive condition check of the artwork,
3. conservation treatments of the eleven individual parts of Taufkapelle, and
4. a storage and preservation plan of the artwork.

This project presents an excellent case study within the conservation ethics of contemporary art and in specific, contemporary installation art and follows up international research projects such as Inside Installation and several other publications on this subject. It presents the conservator's challenges in respecting the artist's intent and spirit as well as preserving the materiality of the object. The successful research and conservation treatment has also contributed to an international revaluation and importance of the artist. In the autumn of 2015, a major retrospective of Buthe will start and the Taufkapelle is seen as one of the highlights of this exhibition.

(99) The Disastrous Copper: Comparing Extraction and Chelation Treatments to Face the Threat of Copper-Containing Inks on Paper

Sara Zaccaron, Postdoctoral fellow, Conservation&Preservation Department, The Sheridan Libraries, Johns Hopkins University, Patricia McGuiggan, Associate Research Professor and Principal Investigator Mellon Grant for HSC, Materials Science & Engineering Department,

Whiting School of Engineering, Johns Hopkins University, Mark Pollei, Senior Book Conservator and Acting Director for Conservation & Preservation, Conservation&Preservation Department, The Sheridan Libraries, Johns Hopkins University, Alessandro Scola, Book Conservator

It is well known that transition metal ions have a detrimental effect on paper documents by endangering their permanence. Among all metal ions affecting the system, iron and copper are the most harmful. In particular, it has been shown that copper exhibits even a greater catalytic activity compared to iron ions thus contributing significantly to the oxidative decay of papers. Iron and copper are the main ingredients of the well-known iron gall inks, the most important writing media in the Western history. The preservation of ink-containing artifacts still represents a great challenge for conservators. Wrong conservation treatments and the lack of available methods tailored to cope with copper-catalysed degradation cause even more serious damages. In the conservation practice, the so-called "calcium phytate/calcium bicarbonate protocol" is so far the only generally accepted method to stabilize iron-containing documents. However, its drawback lies in the uncertainty of whether it can be effective even towards copper ions. It is worth remembering that the degradation of paper continues as long as copper ions are present on the support. Recently, a novel treatment based on reducing monosaccharides in a mild alkaline medium has been suggested as a cheap and easy potential alternative to specifically extract copper ions from ink-containing paper artifacts. Preliminary proof of concept experiments have shown the potentiality of the treatment in removing these harmful species. Nonetheless, the method has not been fully validated yet. In this contribution we present the comparison between the reducing sugar method and the phytate protocol as extraction and chelation approaches toward copper ions, respectively. Performances in extracting metal species and slowing the rate of cellulose degradation were evaluated together with possibly induced side-effects. To this end, both sized and non-sized thermally-aged samples with copper-rich iron-gall inks were prepared. Advanced examinations of molecular weight distributions and carbonyl content (CCOA labeling in combination with GPC-MALLS) were performed to determine the extent of hydrolysis and oxidation thus ascertaining the efficacy in inhibiting degradation and the long-term stability of papers. To evaluate surface changes and possible migration phenomena owing to the applied treatments, colorimetry and LA-ICP-MS were used. Treatment baths were also analyzed to monitor the extraction of metals. Results show that glucose has some extraction capability towards copper and a mild inhibiting effect of metal-catalyzed degradation. Nevertheless, it is less pronounced than expected and some spreading of metal ions throughout the samples has been detected but likely caused by the bathing conditions. We confirm the efficacy of the phytate protocol in inhibiting the iron activity and additionally detect some beneficial effect even towards low amount of copper. A reversion in the color of inks (i.e. darkening) was also observed for both treatments. Despite needs that a proper protocol be set up prior to introduction of the RedS in the conservation practice of metal-containing cellulosic materials, our results positively support the hypothesis that reducing sugars might be used as a cheap and easy emergency strategy for copper-degraded documents with limited threat to the artifacts.

(100) Sustainable Strategies for Mechanical System Operation in Collection Environment

Christopher Cameron, Sustainable Preservation Specialist, Image Permanence Institute, Rochester Institute of Technology,

This poster focuses on the Image Permanence Institute's (IPI) research on data logging within air handling units (AHUs). Knowing how a facility's air handling system is operating is a crucial element of sustainable management of the collection storage environment. Even the most modern systems, if not operating properly, can operate inefficiently and potentially cause damage to collection materials. This inefficiency and risk can potentially go unnoticed and may result in significant loss or harm to the collection. There are some who rely solely on the building management system to monitor their environment. Unfortunately, sensor placement and calibration are critical and one sensor providing bad readings will not only create confusion but cause changes to be made in system operation that may affect the entire collection.

A proper monitoring program can allow staff to follow the airflow and operation of their AHU. This will help identify any faults or inefficiencies within the system and help to avert preservation issues such as accelerated chemical decay, mechanical damage from high or low moisture content, and the risk of mold outbreaks. A monitoring program can also provide comparative data to use in conjunction with the building management system data. The data can track and monitor the air as it flows through the system. It will point out where work is being done by the system, where system inefficiencies may be, and when used in tandem with system sensors the data can identify a sensor that is out of calibration.

This poster highlights field-tested AHU logging techniques and data analysis strategies to help facility and collection care staff optimize system performance while providing a more stable environment and potentially saving on energy costs.

(101) Emergency Preparedness for Academic Museums

Caroline Roberts; Suzanne L. Davis, Associate Curator and Head of Conservation, Kelsey Museum of Archaeology, University of Michigan; Mike Kennedy, Senior Emergency Management Specialist, Division of Public Safety and Security, University of Michigan

This poster uses the University of Michigan's Kelsey Museum of Archaeology as a case study to illustrate how academic museums can utilize on-campus resources and expertise to develop emergency response plans and training programs. Unlike traditional museums, university museums can access significant support for emergency planning: risk assessment, response guidelines and training modules, disaster recovery services, and many kinds of assistance for collections salvage efforts. We describe how the Kelsey worked with University of Michigan emergency management specialists to create two types of response plans—one focused on human safety, and one focused on collections salvage—and we give an overview of the content and structure of these plans.

We also describe the resulting emergency preparedness training program. Developed collaboratively by University of Michigan's emergency management division and employees of the Kelsey

Museum, the training is designed to keep students, employees, and visitors safe in the event of an emergency, as well as to prepare University personnel for collections salvage efforts in the event of a disaster. University museums have high levels of annual staff turnover, since they frequently employ students in many capacities. As a result, regular emergency preparedness training is crucial. At large universities like Michigan, museums must also coordinate response and salvage efforts with their parent school or college within the broader university structure.

Happily, a variety of resources are available to academic museums at each level within the university. This poster illustrates the advantages that academic museums have in emergency preparedness planning, provides links to plans and training modules, and recommends steps that other university museums can follow.

(102) Baseline for the Conservation State of Inka's Mining Complex of San José Del Abra: Identification of Risks and Measures of Monitoring and Control

Daniela Bracchitta, Coordinator of the Investigation and interventions program of archaeological material, Laboratory of Archeology, National Centre of Conservation and Restoration; Roxana Seguel Quintana, Head Conservator at the Laboratory of Archaology, National Centre of Conservation and Restoration; Diego Salazar Sutil, Archaeologist, University of Chile

San Jose del Abra mining complex is situated in the highlands of the SCM El Abra Mining Company ground, in Calama, Northern Chile. It is 3900 meters above sea level, in the middle of the Quebrada (gorge), Casicsa and covers an area of approximately 80.000 m 2. Six main archaeological areas were identified inside the complex, providing information about the organization and functioning of the pre-Hispanic copper-mining during the Late Period (ca. 1450-1536 AD.). The sites are located to the Northwest and Southeast of the Gorge, registering the highest number of stone-walled structures, and other archaeological features in the northern slope, which is characterized by a strong inclination that reaches 35°.

The Laboratory of Archaeology of the National Centre for Conservation and Restoration was requested to establish the baseline for the conservation state of the Inka's mining complex. This evaluation was within the framework of fulfil commitments made by SCM El Abra Mining Company to the National Monuments Council, in order to prevent direct and indirect potential impacts on the archaeological sites, as a result of the new expansion of mining extraction activities. The Laboratory conducted a preliminary assessment of the landscape and characteristics of the sites that were part of the complex, so to generate a proposal for the construction of stone-walled structures, which replicated the ones in the archaeological sites that might be at risk. Those structures would be located close to the current blasting. Raw materials for the construction, built techniques and orientation of the walls, among other factors were considered, in order to evaluate the effects of vibrations on them. On the other hand, a base line for site conservation was elaborated in order to establish preservation measures on some specific areas, without obstructing the progress of mining operations. One of the main results of this work was to establish through empirical studies that the vibrations produced by the blasting to extract minerals were not a significant agent of deterioration for the archaeological mining complex. Furthermore, it was determined that the most affected and unstable areas were those directly linked with anthropogenic, past and present, intervention. Such interventions were related to areas of land clearing, gathering of (waste) rock, and tracks for vehicle transit, which meant a modification of the topography of the area. In addition with the steep slope and environmental agents they had a negative impact on the arrangement of the structures. After the analysis of the topographic modifications and the main environmental agents involved in the deterioration process, some practical measures were proposed to secure the area, such as the photogrammetric lifting of the area- in order to monitor any possible change-, the stabilization of zones constituted of non-consolidated sediment, and rebuilding of collapsed walls at strategic locations.

(103) Copper Based Pigment Alteration from Diaguita Culture

Daniela Bracchitta, Conservator of cultural heritage, National Centre of Conservation and Restoration; Christine Perrier, Geologist and technician in Conservation and Restoration, National Centre of Conservation and Restoratio

The Diaguita Culture occupied the IV Region in north-central Chile between 1000 a.C. and 1450 a.C. (Intermediate Period). Its ceramic iconography is based primarily on 3 different colors: red, white and black. Since 2005, the black color has been the focus of a study at the Laboratory of archaeology at the National Center for Conservation and Restoration (CNCR) in Santiago, Chile. This pigment shows various states of alteration which was corroborated with compositional analysis (EDS, XRD, Raman), imagery (colorimetry, false color), micro-stratigraphy and visual observation.

Macroscopically, the alteration can be seen as a lost of cohesion of the black layer, and a change in color from an intense black, to a reddish brown/greenish brown layer. Cross sections of the ceramics clearly show the various states of alteration that comprise the surface layer. In addition to black to brown variations, a fine layer of green can be detected between the brown (superior) and white (inferior) layers in 2 different thin section samples. Compositional data of the ceramic's black coloring identified Cu as the major component, mainly as the cupric oxide Tenorite (CuO), and lesser Fe in the form of hematite (Fe2O3). Transformation from black to brown is found to be inversely proportional to the quantity of Cu and Fe present in the sample. One rare exception is found in a ceramic that shows evidence of green pigment on its surface. Relations with the black pigment alteration is not clear but XRD analysis shows concentration of atacamite and antlerite, 2 green copper minerals. Coincidently (or not), analysis of pure natural green pigment found in one Diaguita site contains atacamite and antlerite minerals. These results are not surprising geologically as many minerals such as tenorite, atacamite and hematite are found associated with metallic mineral deposits in the ancient Diaguita territory. However, (1) tenorite has not been found as a pure black pigment in Diaguita prehistory; (2) the color green is not part of the Diaguita iconography.

Tenorite forms naturally as an alteration mineral of most copper compounds. Its absence as a natural pigment in archaeological environment leads to the assumption that it was not the original

component for the black iconography but instead, an alteration product. Further investigation is needed to account for the physical and chemical mechanisms responsible for the alteration of the black pigment layer. Is tenorite a primary component or an alteration product? Could atacamite be transformed in tenorite by heat? Do soil dynamics and environmental characteristics play a major role in the equation? Is the composition of the black layer related with the alteration or a consequence of another process? Emphasis will be put on the transformation products of copper minerals by:

1. experimental study of the Atacamite reactions with heat,
2. historical and contextual study of the Diaguita sites
3. empirical evaluations of possible reactions between mineral components of the pigments and the systemic conditions.

(104) Tutankhamun's Shields: Archaeometric Study and Conservation Procedure

Eslam Abd elmaksoud shaheen, Scientific conservator, Grand Egyptian Museum - Conservation Center; Nagm eldeen Morshed Hamza, Scientific conservator, Grand Egyptian Museum - Conservation Center; Mohamed Yousre, Scientific conservator, Grand Egyptian Museum - Conservation Center; Ahmed Mostafa Elshekha, Scientific conservator

Among the military equipment found in the tomb of Tutankhamun were eight shields, four of which are ceremonial and are of openwork wood, incised and gilded. At the same time it provides us a lot of information related to the activity of usage of shields by the king as a symbol of power and strength of the royal authority at that time. Shields made of wood in several pieces pegged and glued together, the border and central panel covered with gesso and gilt, the remaining field covered with the hide of a cheetah (see spots), the hair well preserved. The goal of this study is to identify the structure of shields looking inside the layers of it .made by the priests of the king. Indeed, this study gives us great semantics confirm that the King use these pieces or not, also an Image for development of weapons in the new kingdom. Another hand, this study investigates the feasibility, effectiveness, and overall value of Reflectance Transformation Imaging (RTI) in documenting the shields of Tutankhamen impressions. From where, the ability to manipulate the light source and enhance surface attributes with RTI facilitates identification of important shields features from documentation of shields impressions. Also, this paper compares RTI, digital photography, Multispectral image (Ultra Viol (U.V) and Infrared (IR)) for documentation of shields of the King Tutankhamen. One important and widely used archaeometric studies is handheld XRF (x-ray fluorescence), an elemental analysis technique that quickly and easily provides data regarding the elemental composition of sample, also nondestructive trace element analysis and doesn't alter or deface samples. The analysis by handheld X-ray fluorescence in the shields belong to the king Tutankhamun to identify pigment and composition of gilded layer on it from the discussion of the result we can probably identified the region of the materials which used in the composition of gold alloys in this period. On the other part of our research we explains the cleaning and conservation work done in order to exhibit them properly and preserve them for future generations and allows a glimpse into the work (methodology of treatment and conservation) at the GEM-CC.

(105) Identification of Gesso Scagliola in the tomb of the Royal Family (Muhammad Ali) at El Imam El Shafie Area

Mohamed Atyia Mohamed Atyia Hawash, Assistant Lecturer, Faculty of Archaeology, Cairo University, Egypt; Hala Afifi Mahmoud, Professor of restoration and conservation, Faculty of Archaeology, Cairo University, Egyptt

European Artistic style prevailed at the era of Muhammad Ali family, For example Baroque and Rococo decorative styles and Scagliola that has spread widely in Europe in the fifteenth century in Egypt we can find this style in the Royal jewelry Palace at Alexandria, Champollion palace and sabil "um Abbas" at Saliba Street - Cairo 1867 A.D. The three examples Simulator Natural Marble. Scagliola style implemented in the tomb of the royal family 1805 A.D. at El Imam El Shafie area, in addition to the other stucco works, perforated Windows and gilded stucco. The study was performed in the tomb of the royal family 1805 A.D using various analytical methods such as X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) with EDX unit. The data showed that scagliola carried out on two layers the under layer and other surface layer that gives feel similar to natural stone. The under layer components mainly gypsum, Anhydrite, calcite and dolomite in addition to a small percentage of halite salt. EDX analysis confirm component of colored layer zinc oxide, gypsum, calcite, iron and aluminum oxides. Keywords: Gesso Scagliola, stucco works, the royal family (Muhammad Ali), X-ray Diffraction, scanning Electron Microscopy with EDX, gypsum, Anhydrite, calcite, dolomite, halite, zinc oxide, iron and aluminum oxides.

(106) The Conservation of King Tutankhamen's War Cuirass

Safwat Mohamed Sayed Aly, Conservator at the Grand Egyptian museum, the Grand Egyptian museum; Hadeel Khalil Abd Mohsen Abd Al Rahman, conservator, The Grand Egyptian museum

This poster describes the case study of one unique piece of the King Tut Ankh Amen, the war shield which was discovered and treated by Carter in a desperate try to spread it after the big revealing of the kings tomb, this treatment accelerated the deterioration of the shield therefore it was essential to start with a quick intervention to Stabilize the condition, some analysis are running at the current time to identify the materials were used in the previous conservation plus the materials of the shield. The ancient Egyptians used several materials in the manufacturing of this shield, nine layers of fine linen fixed on it small pieces of leather overlapped on each other and fixed by strings to protect the chest and the stomach area from any attack during a battle. The documentation of the shield was applied by digital photography and digital Scanner, investigations and analysis were imaging with UV and IR lamps, light microscope, some samples were send to investigation by SEM to identify the fibers used in textile, types of leather. Traces of the previous conservation material were sent to FTIR lab to identify the material to start with a suitable conservation plan, the surprise was the presence of a bad smell from the shield and immediately swaps were taken to examine if the piece contains a biological infect or not and according to the result the conservation plan will be designed.

(107) The Effect of De-Pest of Plant Extracts According Paper Works

Raziyeh Taheri, Conservator, The Cultural Heritage Office of Semnan Province, Iran

In this thesis, according to ancient texts from the sixth century on using herbs to prevent damage from insects and pests damage and existing natural compounds in plants and their antifungal effects It has also tried in addition to familiarity and developing a non-toxic and safe method for works, effect of Khuzestan origany herb essence on two most common species of fungi (Asper jilous najer and Penicillium)in the paper empirically and experimentally to be studied. And its effect in several ways such as directly using on the paper used infection to fungus, use of plant oils in liquid and solid medium and its applying as fumigation on container, and examination of oil effect on water-sensitive versions' acid, were evaluated. it is from of the mint family contains several ingredients that one the its most important ingredients is Karoecrol (90/37%) that completely eliminates vegetative and reproductive growth of fungi and also it is safe and secure method for people and the remains of the ancestors.

In this research the effect of essential oil of Satureja Khuzestaniea on two common fungi, frequently seen in cellulose material, "Aspergillus niger" and "Penicillium" was examined. The essential oil was applied on two groups of samples including two cultivated fungi species, and then, two infected documents using fumigation method. Different steps of the examination includes distillation and extraction of the essence using clevenger apparatus, preparing the culture medium, preparing bacterial suspensions using McFarland standard, fungi cultivation, distillation with different concentrations and fumigation and microscopic studies of the fungi. Environmental condition of the culture medium was: Temperature: 20-25 °C RH: 60-65 % Time: 24-72 h In the first step it was revealed that the essential oil of Khuzestaniea in 4-8 % concentration didn't stop fungi growth. Aspergillus niger grew faster than Penicillium in all the tests, due to its high resistance. The minimum inhibitory concentration (MIC) was 10 % in which or higher concentrations the vegetative and reproductive growth was stopped completely. In the next step essential oil was used for fumigating ten samples including historical, Japanese handmade, and new machine-made paper.

Historical samples were examined to trace the fungal infection in black, green and brown colored areas and suspected samples were inoculated into culture medium containing Saboraud Dextrose Agar (SDA). Because of the lack of enough historical samples, six more samples were prepared by inoculating two mentioned fungi into the culture medium and sterilized paper moistened for one month in 20-25 °C. These samples were cultivated again afterwards to examine the growth of fungi colonization, which led to infection of all samples. For the next step a closed chamber was prepared for infected samples equipped by psychomotor, distilled water and 10% concentration (10 g) of essential oil. According to the result, for disinfection of historical documents using fumigation method, 10% concentration and 10 g of above pesticide was not enough, but the suitable result was achieved in 30 % concentration (10 g) of pesticides.

(108) Holographic Archives for Endangered Collections

John F. Asmus, Research Physicist, University of California, San Diego

Following the disastrous and protracted "Acqua Alta" event of 1965 in Venice, work began in earnest on the design and evaluation of tidal closure gates for the three openings that connect the Venetian lagoon to the Adriatic Sea. As participating University of California, San Diego (UCSD, Scripps Institution of Oceanography) oceanographers became disappointed with extensive delays in the overall progress toward design, testing, construction and installation of closure gates, an emergency measure was sought to protect the city's stone sculptures from mild as well as severe floods in the city's immediate future (1971 at that time.) For archival purposes an urgent plan was advanced to record large-format (diffraction-limited, in-situ, and 3D) holograms of the most significant sculptural elements in Venice. Ente Nazionale Idrocaburi (ENI) agreed to sponsor an exploratory experimental study aimed at assessing the feasibility of this novel and risky (never employed outside of an optics laboratory, previously) holographic approach to the conservation of high-resolution 3D images of the sculptural artworks of Venice. A USAF two-stage oscillator/amplifier ruby laser with a ten-meter optical coherence length and several Joules of output energy was made available for the study by the TRW Corporation. In February of 1972 fifty holograms and numerous holographic interfereograms of works by Donatello, Pisano, and others were recorded holographically at the ruby-laser wavelength (694 nm). Scientists from the University of Rome and CNR participated with those from UCSD in this feasibility demonstration.

At this 43rd anniversary of the exposure and development of the holograms as well as the establishment of the archival museum, the holographic media and their reconstructed 3D images were compared with initial assessments pertaining to image characteristics such as optical noise. It was surprising to find that the holographic emulsions together with the quality of their associated images had suffered degradation. Consequently, more care must be exercised in storing such holograms for archival purposes.

(109) Optimized Laser Cleaning for the Conservation of the Ghiberti's Doors at the North and East of the Baptistery in Florence Italy

Laura Bartoli, Conservation Technologies Specialists, El. En. S.p.A.; Alessandro Zanini, Conservation Technologies Department Manager, El.En. S.p.A.

The two famous sets of gilded bronze doors, located at the north and east sides of the Baptistery of Florence, were built from 1403 to 1452 by Lorenzo Ghiberti. The north doors, built between 1403 and 1424, is formed by twenty-eight tiles in a mixed-line frame (quatrefoil), arranged in seven rows of four. Given the great success that this work had at that time among the Florentines it was decided to commission Ghiberti to create another set of similar doors at the Baptistery. The east doors are composed of 10 panels, five in each door, framed by a continuous sequence of gilded heads, floral motifs and niches. The work to create this second set of doors took 27 years to complete,

from 1425 to 1452. When these doors were finished, Michelangelo was so amazed that he stated the doors were "worthy of Paradise," thus they were called thereafter The Gates of Paradise.

Over the centuries, The Gates of Paradise suffered deterioration from exposure to the elements and neglect. Then in November of 1966, a catastrophic flood in Florence severely damaged the doors. Following the flood, work to restore and conserve the doors was begun at the Opificio delle Pietre Dure in Florence. The complicated issue of cleaning the gilded perimeter frieze, without removing it from its location, led to the use of a laser technology specially optimized in its emission parameters to effectively and safely clean the gilding amalgam completely covering the frieze. The resounding success of this innovative process led to its use for the subsequent cleaning of the North Gate at the Baptistery which was completed in September of 2015. Precise and gentle laser cleaning enabled conservators to bring back the former splendor of the gilded scenes within the tiles on these magnificent doors. This contribution will outline the special features of the laser process and how it was optimized for this unique project and will show how this innovative technology has been able to solve a major conservation problem: the cleaning and preservation of very ancient bronze gilded objects.

(110) Brown County Plan

Louise Pfotenhauer, Collections Manager, Neville Public Museum of Brown County

The Brown County Federation of History Museums (BCFHM) was established in 2006 to promote greater awareness of area history museums and build lasting cooperation among member institutions. Member organizations include: the Brown County Historical Society, University of Wisconsin – Green Bay (UWGB)—Archives and Area Research Center, Oneida Nation Museum, National Railroad Museum, De Pere Historical Society, Heritage Hill State Historical Park, Green Bay & De Pere Antiquarian Society, and the Neville Public Museum of Brown County (a department of local government). Member institutions coordinate yearly activities, participate in joint marketing, and make the most of limited resources to enhance professional development amongst all members.

In 2011 the BCFHM member institutions requested and received a grant to develop coordinated disaster plans, provide hands-on disaster scenario training, purchase emergency supplies, and cross-train between institutions. The idea behind this coordinated planning was to provide an efficient and low cost method to limit the damage caused by a catastrophic event and to help ensure the long term preservation of the unique cultural heritage of Brown County, Wisconsin. BCFHM wanted to pool its resources to not only provide all its member institutions with the necessary training to handle emergencies, to coordinate use of limited local resources, but also to cross-train at each other's institutions so that when and if disaster strikes we will be prepared to work together. Disaster planning was at the top of the list of our mutual concerns and seemed a great opportunity to deepen our cooperative efforts in a way that helped the entire community. While each institution has a unique mission and thereby unique historical collections and organizational structures, we are all bound by our mission to tell the story of Brown County's history through original materials in a variety of formats (objects, manuscripts, photographs, multimedia). We all recognized that a well-written disaster plan was the key to minimizing the damage done by any catastrophe.

As an initial starting point, the BCFHM wanted to ensure that each of our historical organizations had a written procedure in place to deal with emergencies. We also provided intensive hands-on training to key staff members on how to handle disaster situations, who would then relay that information internally to larger groups of staff and volunteers within each organization.

After establishing this groundwork, members were cross-trained at each institution in order to understand any unique characteristics of each institution's site and collections. Our ultimate goal was to have a coordinated, professional plan in place at each of our institutions for handling a disaster and, thereby, ensuring the safety of our visitors and staff and the continued security of our shared heritage. The effectiveness of this training can really be known only in the face of a real disaster— which we sincerely hope that will never become reality.

(111) Unexpected Allies: Conservation and Health & Safety Colleagues

Sherry Phillips, Conservator, Contemporary and Inuit Art Collections, Art Gallery of Ontario, Sandra Deike, Manager, Health & Safety, Art Gallery of Ontario

A renewed focus on health and safety at the Art Gallery of Ontario in Toronto has had a significant impact on the practice of conservation at the museum. The unexpected is to be expected especially when working with contemporary art. Whether a last minute change to an installation plan, or a curator's announcement of an extraordinary artwork coming in to the collection, we seem to more frequently delve into fields beyond our usual comfort zone.

We work more safely, in a safer space. Health and safety risks for visitors and staff arising from contemporary installation works are more effectively addressed in collaboration with artists, curators and others. Hundreds of public programming and events delivered annually by our colleagues in the Education, Development, and Food & Beverage departments are collaboratively developed with a new focus on the physical safety of both the people and the art that we care for. There has been a cultural shift across the organization increasing the integration of conservation, and health & safety, across the organization and allowing all of us to be more effective. In this presentation an occupational hygienist and a conservator, both from the AGO will talk about the experience, and will share tools and tips we have developed over the course of our partnership.

(112) Resilient Heritage: Protecting Your Historic Home From Natural Disasters

Sarah Marie Jackson, Architectural Conservator, National Center for Preservation Technology and Training

Beginning with Hurricane Katrina and continuing through Hurricanes Ike and Sandy, the National Center for Preservation Technology and Training (NCPTT) has garnered valuable "boots on the ground" experience responding to cultural resource needs in post disaster response and pre-disaster planning. As a result, NCPTT was

approached by the Louisiana Division of Historic Preservation to create "Resilient Heritage: Protecting Your Historic Home from Natural Disasters." Funding for this project was provided by the Louisiana Governor's Office of Homeland Security and Emergency Preparedness. While owners of historic residential buildings are the target audience, many others can benefit from the information provided. Implementing the guidance outlined in this booklet will be a key tool in helping to safeguard historic buildings and possibly help prevent repetitive property loss, while maintaining the integrity of the historic building for years to come. This manual includes recommendations for ways to better prepare or harden historic homes to withstand disasters. While focused primarily on hurricanes and flooding, it also offers strategies on protecting buildings from hail storms, ice storms, tornadoes, coastal subsidence, wildfires, dam and levee failures, and hazardous materials spills.

(113) Diagnostic Imaging Techniques for the Identification of Tortoiseshell

Lesley Day, Third Year Graduate Student, UCLA/Getty Program in Archaeological and Ethnographic Conservation; Ellen Pearlstein, Associate Professor, UCLA/Getty Program in Archaeological and Ethnographic Conservation

The focus of this paper is the documentation of a specific patterning, found within and unique to tortoiseshell, made up of random swirling lines, which most likely correspond to the yearly depositions of keratin that occur as the turtle grows. This phenomenon has been observed in passing in some literature, but has not been fully characterized and is little understood in any discipline. The patterning has been observed as topography in some antique tortoiseshell samples, and also as darkened lines in an example that appears to have suffered light damage. This paper will illustrate how documentation techniques including UV-induced visible fluorescence (UVIVF) and Reflectance Transformation Imaging (RTI) have proven to be extremely useful in observing and documenting the pattern, and how characterization and further understanding of the pattern can be used as a diagnostic criteria for distinguishing tortoiseshell from imitative materials such as plastic and horn.

The documentation methods applied further illustrate my research about light-induced alterations to tortoise shell, and specifically how imaging techniques reveal light induced alterations to the patterning described. For the study, two taxidermied hawksbill turtles (Eretmochelys imbracata) were generously donated by the US Fish and Wildlife Department of Forensics, and the scutes from one turtle carapace were removed for use as the sample material. The samples were subject to accelerated light aging under three different parameters: exposures mimicking window lighting (which filters some UV), museum lighting (which filters nearly all UV) and a chamber emitting UVA radiation. An important outcome of this research is a better understanding of photochemically induced alterations in tortoiseshell, and preventive lighting guidelines for tortoiseshell materials based on the findings of the light aging study.

(114) Natural Disasters and Cultural Heritage: the Italian Case

Marzia Loddo, Ph.D. student, Politecnico of Milan

In the last 20 years Italy, as much as other countries, have witnessed serious climatic changes affecting not only people's life, but also the environment and cultural heritage. The recent study WordlRiskReport 2012, presented in Brussels by the United Nations University within Alliance Development Works and The Nature Conservancy took into consideration the risk factor of each country for being affected by a natural disaster. 173 countries in the world were considered, where Italy occupies the 116th place and only the 5th in Europe. Among the most recent natural disasters that took place in Italy we can distinguish earthquakes in Aquila and Emilia-Romagna (2009 and 2012), floods in Liguria (2014), Veneto (2008) and Sardinia (2008, 2013 and 2015). After these disasters, I have witnessed the serious loss of important buildings and monuments and the irreparable damages of the artefacts stored in unsuitable warehouses. However, not only these major disasters affect the nation but also an increasing number of events related to climatic changes need to be taken into account. Italy lacks a safety plan and infrastructure to prevent extreme natural disasters and environmental degradation. So far the government was concentrated on repairing the damages more than elaborating a prevention plan. The scope of this research is to evaluate natural disaster damages, their effects on art objects and/or artefacts stored in museums. The main focus is on museum storage solutions and conditions, often ignored or inadequately preserved, and research on the connection between storages and works of art. In Italy is common that art collections are exhibited and stored in listed buildings. Usually we find a deposit of a museum, located in an antique palace, in the underground level, without any concerns about climate system controls. Thus when a collection cannot be exposed due to space issues it stays most of its time stored in the deposit without proper conservation care.
This problem must be addressed; in fact the museum should be equipped with an adequate storage system capable of dealing with different types of artefacts according to their nature, and also should be prepared to confront the problems caused by natural disasters.

(115) Architectural Strategies for Collections Preservation During and After a Natural Disaster

Sami M. BaSuhail, AIA, President & CEO, Basuhail Architects PC

Protecting collections during and after a natural disaster is a daunting task. Natural disasters can compromise the collections by damaging the very buildings they are housed in, causing physical damage at the initial disaster event, then inflicting additional damage by loss of proper environmental conditions in the facility. This presentation describes architectural strategies and techniques that can help save a collection in the aftermath of a natural disaster. These strategies include both passive and active systems designed to allow the collections "vault" to first survive the initial impact of the natural disaster, and second to continue to function at some minimal level independently from the the city utilities (gas, water, electric) that may not be available after a natural disaster and to continue to provide the correct environmental conditions for the preservation of the collection. The term "vault" may refer to anything from a small room to an entire building. In order to conserve resources and control costs

this "hardening" of the building is applied to the collections vault only and not to public lobbies for example. These strategies include:

Structural Redundancy: Designing the structure and the cladding beyond the basic building code requirements and adjusting for local probable events (earth quake, gale winds, hale etc.) will protect from damage resulting from torn off roofs, blown out windows, and other structural damage that compromises the integrity of the building "envelope" that is protecting the collection.

Thermal Control: Through the use of sophisticated wall, roof, & door systems the collections vault can be isolated thermally from the remainder of the facility and from the outside environment. While this strategy can save energy during the normal operation of the building its main benefit is the maintaining of optimal temperature and humidity after a natural disaster where electrical power is not available to run HVAC equipment.

Bio-climactic design: This design strategy naturally cools the vault in summer and naturally heats the vault in winter. The design is specific to every geographic location. Computer controlled dampers and vents adjust interior environmental conditions automatically to maintain the optimal conditions.

Emergency generation systems: The loss of electrical power is the main cause of deterioration of environmental conditions of collection areas due to the shutting down of the HVAC systems. Solar power panels and electric wind turbines can provide for the electricity needed for minimal environmental controls and are immediately active and not reliant on fuel delivery for traditional diesel electric generators. The proper application of sophisticated architectural strategies can increase a collections initial survival rate and prolong and in some cases indefinitely maintain the proper environmental conditions for collections preservation after being subjected to a major natural disaster.

(116) The Painting Materials and Techniques of Artist Feyhaman Duran

Gulder Emre, Assistant Professor, Istanbul University Faculty of Letters, Department of Conservation and Restoration of Artifacts; Hazal Ozlem Ersan Erus, Chemist, Istanbul Metropolitan Municipality, Directorate for the Inspection of Conservation Implementations (Kudeb)

Feyhaman Duran lived in Istanbul between 1886-1975. He graduated from Mekteb-i Sultani, which is known today as Galatasaray High School, in 1908. It is clear from the charcoal portraits of his friends he painted and the caricatures he drew during those years that he was fond of art. Talented in calligraphy as well as art, Duran became a calligraphy teacher at Galatasaray High School, from which he had graduated. He was among the founding members of the Ottoman artists community established in 1908. Later in 1912, he helped with the reorganization and coordination of the Turkish Artists Association, and in 1926, the Fine Arts Association. Prince Abbas Halim Pasha, whom he met by coincidence in 1910, helped him go to Paris, compensating the artist's educational expenses. Feyhaman Duran studied art at the then famous schools Academia Julian and Ecole Des Beaux Arts, and continued his studies in the Cormon workshops of Jean Paul Laurens, who was among the famous artists of that period. As World War I began, Duran returned to Istanbul. Following his return, he started working as a teacher at Sanayi Nefisiye School. He was among the artists who characterized the 1914 Generation.

Feyhaman Duran is one of the first names which come to mind when the subject of contemporary Turkish art is raised. As an artist of many styles, Duran was influenced by impressionism. He is especially well known as one of the pioneering artists of Turkish portrait art. In portrait painting, which does not always comply with the rules of impressionism, the artist might be said to have somewhat benefited from impressionism using light and shadow forming and free brush strokes. While the dominance of warm colours can be felt in his paintings, the colours and light are in harmony.

As part of a project, Feyhaman Duran's paintings were examined using SEM-EDX, EDXRF, FTIR, and HPLC respectively, and pigment and binding analyses were made. The aim was to carry out studies in order to form a database related to Feyhaman Duran.

In these examinations, it was detected that white chalk, titanium white, zinc white, and litopone were used for the color white; cadminium, orpiment and zinc yellow were used for yellow; ferrous oxide and vermillion red were used for red; ultra marine was used for blue; ivory black was used for black; and finally, chromium oxide, malachite, earth green was used for green. Gum arabic, gum tracanth, linoleic acid, linseed oil, and glue bead were detected as binding materials. No signs of drafting/sketching were encountered in the paintings examined. Another finding is that the artist mixed titanium white with lithopon and prepared white paint, and then used this mixture either to lighten other colours or paint white areas. This reflects a characteristic of the artist. Although this characteristic of Feyhaman Duran does not give a result alone, it can be a feature that one should investigate in the artist's painting about forgery.

(117) Study of Drying Process and Recovery of Iron Gall Ink Manuscripts Affected By Flooding

Janet Diaz Navarro, Directora Programa de Conservación Patrimonial y Servicios Bibliotecarios, Fundación Antonio Nuñez Jimenez de la Naturaleza y el Hombre

Water is the most important problem in any sinister in archives and libraries. Flooding from storm surges, river flooding, heavy rain, elimination of fires, pipe breaks, among others are disasters that can affect libraries and archives causing heavy losses. Having a plan of action and know the steps to take in case of an incident like this is a guarantee to have less damage. Iron gall ink manuscripts have different degrees of deterioration by internal factors that directly influence their conservation. The corrosion process of the ink makes many documents are in poor or bad condition. Simulation of flooding processes in materials with iron gall ink, and the evaluation of different methods of drying and recovery are studied in this report.

(118) What's Next on Grand Egyptian Museum Conservation Center

Israa Mohammed Ibrahim Saied, Conservator, Grand Egyptian museum conservation center; Shimaa Mahmoud Omar, Conservator, Grand Egyptian museum; Nesrien Mohamed Atef, Conservator

The paper will present what's next on all the aspects of Grand Egyptian Museum (GEM), scheduled to open in 2017, including its purpose, architecture, exhibitions, collections, and especially

conservation. The GEM will become a major hub for worldwide Egyptologists to study pharaonic history and a must-visit place for visitors from all over the world. The museum aims at taking grasp of the diversity of ancient Egyptian heritage of monuments and arts needed to be exhibited at one place to maintain and preserve this huge legacy.

As an affiliated institution of GEM, its Conservation Center (GEM-CC) was inaugurated in 2010. It has already housed more than 11,000 ancient Egyptian artifacts in its storage rooms, including the King Tutankhamen collection to be exhibited in the new museum, so that GEM-CC has been deeply devoted to conservation of these precious and indispensable artifacts.

GEM-CC is a well-equipped facility comprising 17 laboratories specializing in conservation and scientific research and analysis. Seven conservation laboratories are consisted of Stone Lab., Wood Lab., Organic Lab. (textiles, leather and papyrus), Inorganic Lab. (ceramics, glass and metals), Heavy Artifacts Lab., Special Project Lab. and Human Remains Lab. Others, such as Scanning Electron Microscope Lab., Light Microscopes Lab., Chemical Analysis Lab., Microbiology Lab. and Photographic Studio, are specialized in scientific researches for analytical purposes as well as archeometrical and conservation study.

Collaborative activity between conservation and scientific research is usual in GEM-CC, so that mutual understanding has developed effectively for scientific conservation. With the assistance of both technical and scientific consultants for all the fields of GEM-CC including its HVAC system, security and health and safety, GEM-CC is required to be the first institute equipped with international standard of conservation in the Middle East and South Africa region.

With close relation of Japanese conservation experts, Japan International Cooperation Agency (JICA) has supported technically GEM-CC since 2010. The JICA GEM-CC Project planned the training program as the main frame for the capacity development of GEM-CC staffs and it has advanced to hold the training courses in Egypt, Japan and developed countries for all the fields of conservation such as preventive conservation, conservation science and remedial conservation. Through the continuous technical cooperation, knowledge and practices of the staffs have been significantly developed, so that GEM-CC is expected to be an excellent regional institution in the near future.

(119) Comparative Study for Affirmative and Passive Influence of the Mechanical and Chemical Cleaning for Copper Mirrors Housed in the Grand Egyptian Museum

Israa Mohamed Ibrahim Saied, Conservator, Grand Egyptian Museum; Nesrien Mohamed Atef Kharboush, Conservator, Grand Egyptian Museum; Shimaa Mahmoud Omar, Conservator, Grand Egyptian Museum; Emam Abdulla Emam, Head of Inorganic Artifacts Lab, Grand Egyptian Museum

The aim of this paper is to represents the comparative study between the affirmative and passive influence; for the mechanical and chemical cleaning applied on copper mirrors stored at grand Egyptian museum. The statute which was manufactured by hammering technique dates back to late period, nowadays in inorganic laboratory of the Grand Egyptian museum. Small samples were taken from the corrosion products and were analyzed using X-ray diffraction, the result highlighted the type of the copper based corrosion products, and based on the result we were able to understand the burial environment of the mirror before the discovery. The result of the analysis that mirror is buried on clay soil and the encrustation of corrosion mixed with soil Both optical microscopy and scanning electron microscope were used in the assessment of the influence of the chemical cleaning, on the first example, the results proved the disadvantages of the chemical cleaning on the deteriorated surface of the mirror. While on the second example the mechanical cleaning proved to be the most adequate method in the removing of the corrosion products without disturbing the original archeological surface if the metal and the authenticity of the object. Conservation procedure started by the mechanical cleaning to remove the corrosion layers, finally this research highlights the influence for the mechanical cleaning than chemical cleaning for metals.

(120) June 1962's Algiers University Arson: A Well Planned Crime

Hachani Samir, Algiers University

On June 7th 1962; a billowing smoke rose above Algiers: the Algiers' University library had been burned almost completely by the extremist O.A.S. (Organisation de l'Armée Secrete- Secret Army Organization)at the very end of the Algerian conflict and following a long and painful war that led to the independence of Algeria after 132 year of colonialism. Not much is known about this crime because of the circumstances in which it was perpetrated: the unbearable and lawless period between the cease fire signed on March 19th 1962 and July 5th 1962, the official date of the independence. After the cease fire signing, French nostalgic did everything they could to keep Algeria under French domination. After a coup that nearly toppled the French government in the metropolis, the O.A.S. practically took control of Algiers (and the big cities) and started then a period of intense urban guerrilla that saw hundreds if not thousands of people killed .It is during this murky and somber period that the O.A.S. perpetrated its ignominious crime and burned what had been estimated at over 250 000 items out of the 600 000 the library housed.

The purpose of this research is to locate items that were illegally transferred by the French in that troubled period. The research started by the assumption that the crime was a very good way to hide precious material and transfer it to France just before the independence. This assumption arises from different testimonies saying that batches of books, and even incunabula, were seized just before being shipped to France among which the first Head of National Library of Algeria. We will try to prove that very precious materials were taken to France in that troubled period and the fire was a very astute way to "transfer" these books, incunabula and other precious items. The way the fire was handled adds to this impression that behind the O.A.S., there was a clear intent to cover up at the highest level this theft. We will also show that the June 7th 1962 was the culmination of a series of crimes the French perpetrated in Algeria during the 132 years the colonization lasted.

(121) Scientific Study About Dismantling and Re-Assembly of Limestone Stella, Housed in the Grand Egyptian Museum

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For long time many stone artifact had previous conservation like re-assembly, completion, consolidation and etc…and sometimes some of conservators tried to make first aid treatment for the excavated artifacts. In these periods the materials which used for the conservation processes were sufficient but after the scientific progress in the manufacture of materials and the new researches new materials were appeared and the previous conservation materials became useless so we try to remove them and use the appropriate material for conservation. We focus on this study about dismantling and re assembly of lime stone Stella number (20431) gem (19599) it previously stored in the Egyptian museum the real provenance upper Egypt governorate of Luxor, Thebes west bank, sheikh abd el-qurna, period middle kingdom ,has hieroglyphic writings and inscriptions divided into two detached parts This Stella belongs to nefer-hotep, divided into five registers, depicting 2 seated figures. One to the left facing a standing man and the other to the left and behind him is a standing woman below this are 8 kneeling figures, Fixed on a wooden support and previously conserved some cleaning and assembly processes and preparation for the exhibition). While we are investigating the Stella we found that the two detached part of the Stella were fixed on a wooden support not connected together and had a missing part between them In this case we began with archaeological study then we made photographic documentation and auto CAD, 3D-max, on other hand we use photo shop documentation for the documentary hieroglyphic inscriptions and drawings found on the Stella's surface beside that we stat analysis and investigations using stereo-microscope and x-ray diffractions. For the conservation of the Stella we used reversible materials for re-assembly of the Stella also we prepared the Stella for the exhibition using plexi glass support as a modern technique. The documentation of the Stella using the modern programs helped us in the re-assembly of the Stella.

(122) Beyond the Visible, Combining Scientific Analysis and Conventional Methods for Documentation the Collection of Tutankhamen's Loincloths

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An impressive number of textiles found in the tomb of king Tutankhamen. Howard Carter recognized that, the material from this tomb will be of extreme importance to the history of textile art and it needs very careful study." The collection of the textile of the King Tutankhamen are divided into 740 garments, shrouds, covers of statues, loincloth and textile objects as quivers and sails of boats models were found. The textiles were found distributed inside rooms of the tomb stored in several chests and boxes, some of them used for wrapping funerary equipment, in other cases they form part of elaborate, ceremonial robes covered with gold sequins and embroideries. This study focus on one of the garment pieces from the wardrobe of the king Tutankhamen, the loincloth which have a striking Number of loincloth estimated 145 bundles rolls these still remain unfolded because of their delicate condition . Loincloth is a simple garment has triangular form one of the few garment worn by men and women also which wrapped around the waist while the rest is drawn between the legs. Similar example from this collection display now in the Egyptian museum in Tahrir. The goal of this study is to identify the folding system of loincloth made by the priests of the king. Indeed, this study gives us great semantics confirm that the King wears these pieces, also an Image for the fashion style of loincloth and the structure details of the king's body. Another hand, this study investigates the feasibility, effectiveness, and overall value of Reflectance Transformation Imaging (RTI) in documenting the loincloth of Tutankhamen impressions. From where, the ability to manipulate the light source and enhance surface attributes with RTI facilitates identification of important textile features from documentation of textile impressions. Also, this paper compares RTI, digital photography, Multispectral image (Ultra Viol (U.V) and Infrared (IR)) for documentation of varied textile of the King Tutankhamen. Finally, the loincloth of Tutankhamen was investigated by optical microscope, polarizing microscope and Scanning Electron Microscope (SEM) to obtain a more detailed observation of the condition and physical characteristics of the fabric.

(123) Application of Handheld X-Ray Fluorescence Analysis in the Arrows Collection for King Tutankhamun

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The collection of arrows belongs to the king Tut (18 Dynasty considered the most complete collection of arrows discovered till now, at the same time it provide us a lot of information related to the activity of usage of arrows by the king as a symbol of power and strength of the royal authority at that time. a considerable number over than 430 arrows. Carter (109) makes reference to sixteen different classes of arrow varying in detail and size. A proposed discusses the result of analysis for arrow's head by XRF first to identifying the composition of bronze alloy's in this period from the concentration of the elements in bronze heads. Glass head analysis gives information about Elemental Composition of glass and Other Lithic materials as evidence of human trade and migration. One important and widely used archaeometric studies is handheld XRF (x-ray fluorescence), an elemental analysis technique that quickly and easily provides data regarding the elemental composition of sample from magnesium (Mg) to uranium (U), also nondestructive trace element analysis and doesn't alter or deface samples. The analysis by handheld X-ray fluorescence in the arrow belong to the king Tutankhamun concentrated on the heads of arrow which include glass, bronze and pigment on the main shaft of arrows .from the discussion of the result we can probably identified the region of the materials which used in the composition of glass, also we can interpret the using of some materials during the manufacture technique. From the analysis of

bronze head we can compare between different shape of bronze head and the composition of it, and unmistakably identify the composition of bronze alloys with additives materials in this period.

(124) Investigation Into the Removal of Arsenic-Based Pesticides on Feathers

Jae R. Anderson, Student, University of Arizona Materials Science and Engineering; Nancy N. Odegaard, Head of Preservation Division, Professor, Arizona State Museum/University of Arizona; Werner Zimmt

Arsenic is a naturally occurring chemical element with a chronicle dating to ancient times. A toxic substance used as an antiquated preservation treatment to deter pests from museum collections has lead to potential health risks. The identification, detection, and quantification of arsenic on museum collections have been substantiated with portable X-ray fluorescence (pXRF).

The removal of arsenic-based pesticides from museum collections is a complex conservation issue. The Arizona State Museum addresses this, in part, through research on the removal of this toxic substance from wool textiles. The positive results prompted this study to determine the effectiveness of arsenic removal on feathers by replicating conditions for an aqueous treatment formulated for textile collections.

A bundle of great horned owl and tuft of turkey feathers were independently submerged into a calculated volume of deionized water for ten minutes with manual agitation. A second treatment of five minutes was implemented to further evaluate the effectiveness of arsenic removal with sequential treatments of differing times. Effectiveness was quantified by measuring corresponding areas on single feathers before and after treatment with portable X-ray fluorescence (pXRF). Measurements on bulk great horned owl feathers were also evaluated to corroborate the removal of arsenic. Supplementary analysis utilizing Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) on post-wash solutions confirmed the transfer of arsenic from feather to water. Overall, ~74-86% of arsenic was removed from each species of feather. The first treatment removed a greater percentage of arsenic (~73%) in comparison to a second treatment (~10-11%) determining an inverse relationship between the effectiveness in arsenic removal and number of treatments. Analyzing individual feathers also resulted in a greater percentage of arsenic removed (~85-86%) compared to bulk feathers (~74%). The presentation of this study most importantly demonstrates a conservation method to reduce arsenic-based health risks on feather collections.

(125) When the Visitor Experience Goes Wrong: Unexpected Guest at Marisol Escobar's The Party

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

The Party is an ensemble consisting of fifteen freestanding, life-size figures and three wall panels, with painted wood and carved wood, mirrors, plastic, television set, clothes, shoes, glasses, and other accessories. Despite our best intentions accidents do happen. Recently our museum experienced an incident where a visitor tripped over a barrier and fell into one of the life-size statues creating a domino effect in which one figure struck another sending sculptural elements including a multi-tiered ceramic crown crashing to the floor. This paper discusses the nature of the incident and activities surrounding the aftermath taking into consideration the roles of Security, Senior Management, Public Relations, and Conservation as part of damage control and clean-up. It will review lessons learned, conservation activity and treatment, and new procedures implemented in the wake of a significant gallery incident.

(126) Disaster Response and Environmental Standards: A Misunderstanding?

Andy Calver, Head of Care & Conservation, Imperial War Museums

During the First World War, the fear of bombing led to some museums in London moving collections to storage in underground railway tunnels. Unfortunately, the high relative humidity (RH) in the tunnels led to extensive mould and corrosion. When the Second World War was on the horizon, museums and galleries prepared again to evacuate their collections but wanted to prevent this damage. This is the story of how one restorer's lack of work during this storage period led to the erroneous belief that the conditions in a slate mine in Wales were fortuitously perfect for the preservation of works of art and thus the ideal conditions for the future. It will be shown that far from being some magical pre-existing environment, it was created by simply heating the space to match values that had been obtained by experiments before the war. These showed the mean annual relative humidity conditions within the National Gallery. They were obtained before powerful heating was introduced and the temperatures were much lower than would be acceptable for human comfort today. It will be argued that while it is true that a stable RH will limit moisture induced movement in organic materials that may lead to cracking and potential loss, any stable humidity within a range of 30-65% would have been acceptable. Using reported case studies it will be shown that the adoption of 60%, then 55% and eventually 50% relative humidity as a magic number to maintain in galleries throughout the world has probably led to more economic, cultural, architectural and object damage than the potential damage it was intended to avoid.

Garry Thomson is often erroneously blamed for strict environmental standards by those who can't read a whole book. However, he showed in 1977 that maintaining a stable RH for objects and works of art is simple if enclosed in a low air exchange enclosure with a suitable quantity of moisture buffering material. However, since then, a lack of understanding of the basic principles and attempts to keep to the mythical ideal of 50 or 55% RH has led to numerous failures, criticism of what is an ideal low energy approach for many countries, and a plethora of failed air conditioning systems or case based climate generators. Using case studies we will show that if you are content with the annual mean RH in your museum, gallery or storage area (which for organic materials could be within 30-65% RH) you can maintain a stable RH within +/-5% of this (in a heated building in the UK this will normally be around 40% RH) with the cheapest bulk silica gel and never have to recondition it. As Thomson illustrated it does not matter that your RH plummets to 15% in the winter or increases to 75% in the summer – it is the annual mean RH which is the determining factor. If this is acceptable you will have a stable, self-regenerating environment that requires no maintenance and avoids the potential for any RH induced disasters.

(127) Keeping It Fresh: the Preservation of Josh Kline's Skittles

Ellen Moody, Assistant Projects Conservator, MoMA; Lynda Zycherman, Scupture Conservator; Chris McGlinchey, Sally and Michael Gordon Conservation Scientist

This paper will describe a cross-disciplinary preservation strategy developed for a contemporary installation comprised of proprietary materials threatened by both obsolescence and decay. In June of 2015 the Museum of Modern Art acquired Josh Kline's Skittles of 2014, a refrigerated display of bottled concoctions blended by the artist. Appropriating the branding strategies of consumer culture, Skittles is a luxury "juice bar," stocked with 15 colorful flavors in 16oz bottles. Though locked, the transparent refrigerator door allows visitors to read the labels printed on the bottles, whose names and ingredients conjure a particular contemporary lifestyle. For example, "Nightlife" is made from Coke Zero, octopus ink, Raid roach killer, Cool Water cologne, and bath salts, while "Big Data" contains ground up Google glass, omega 3 fish oil, a Verizon bill, and Purell. Both unexpected and topical, these juices satirize lifestyle brands, aspirational marketing and, of course, the current juice-cleanse craze.

This work's complex materials list requires both conceptual and material considerations. Conventional conservation methodologies for such works are largely preventive, seeking to slow deterioration and guard against obsolescence. One strategy, for example, is to stockpile components threatened by extinction, like fluorescent bulbs in Dan Flavin's work. But many of Kline's ingredients are perishable and volatile and therefore resist both a "hoarding" method as well as the typical arsenal of preventive strategies for long-term storage. Working closely with the artist and MoMA curators, Conservation has developed a multi-faceted approach, combining materials-based, analytical and preventive conservation practices—such as spectrophotometry and liquid storage strategies borrowed from natural history conservation—with methodologies adopted for variable art, including replacement and reinterpretation. Through artist interviews and documenting co-produced iterations of the work, Conservation aims to extract what Kline sees as the essential, "timeless" qualities of each ingredient, and the installation as a whole, which include maintaining its elements of surprise and recognition. While acknowledging that it is impossible to imagine what may resonate in a world without Coke Zero, Conservation's goal is to establish parameters of significance and document them so they can inform future installations of this work and, hopefully, allow it to engage future audiences.

(128) From Factory to Museum: A Review of the Chemical Corrosion Models of Float Glass Used for Vitrines and the Methods Used to Protect them With Consideration for the Future Challenges Presented By a Changing Climate

Emma Moore, Scientist, ClickNetherfield Ltd.; Alistair Williams, Operation Director, ClickNetherfield Ltd.

Glass materials are incredibly important to our heritage, both as a constituent of construction and as objects of cultural interest. Despite the inert reputation and the differing compositions of historic and modern glass, there are many processes which threaten to damage both irreparably. This paper will consider the various corrosion models of glass which have been proposed, reviewing the common mechanisms that may take place during production, transportation and finally showcasing in a museum environment. It will then go on to consider the different methods of protecting glass from corrosion and how such methods might be improved in the future before considering the difficulties which climate change might pose.

Environment is key to real world models of corrosion, and while experimental models provide valuable insights into the mechanics of potential outcomes due to climate change, there are limitations due to current technology and uncertainties. Corrosion of glass occurs under various unpredictable conditions so complex that sophisticated computational models which can be adjusted for many variables would be best for predicating rates and outcomes of corrosion in various environments. This is important when considering the role that climate change and atmospheric pollution might play in the degradation of glass surfaces. Spaces that once provided an ideal environment for glass artefacts and structures may find themselves facing new challenges, however it is important to maintain ongoing records and observations of relevant factors rather than relying solely upon the estimations of computer systems not yet powerful enough to plot the whole picture with certainty.

This is a review of metadata, research and findings, placing them in the frame of glass for showcases.

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Image: Excavating paint layers of Robert Murray's, *Duet (Homage to David Smith)*, 1965, photographed in 2014. Art: ©Robert Murray.

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