October 2005 through September 2006
Preface: MCI Overview

The Museum Conservation Institute (MCI) is a research unit of the Smithsonian Institution. Its mission is to increase and disseminate scientific knowledge that improves care and conservation of Smithsonian museum collections and related material, and contributes to their contextual interpretation. MCI staff members collaborate with museum conservators, curators, and scientists to conduct research programs in conservation, in addition to studies of collections that serve the needs of Smithsonian museums. The Institute serves as a source of technical information, advice, and assistance to the Smithsonian and other institutions. Its specialized collections and conservation research is vital to the work of the Smithsonian museums and collections, and to the greater museum community as well.

History
In 1963, the research unit that is now called MCI was established by the Smithsonian Board of Regents to respond to the need for a scientific laboratory to support collections conservation in the whole Smithsonian. A newly graduated conservator, a chemist, and a secretary with a background in the arts comprised the first staff of what was then known as the Conservation Research Laboratory (CRL). In 1965 the name was changed to Conservation Analytical Laboratory (CAL), to better reflect the needs of its constituents. With its move to the Museum Support Center in Suitland, Maryland, in 1983, the laboratory accepted a wider range of responsibilities, including a congressionally mandated national conservation training program and expanded research programs in conservation. In 1998 the Board of Regents approved another name change—to Smithsonian Center for Materials Research and Education (SCMRE)—in recognition of the expanding scope of the laboratory’s work. The 2006 name change to Museum Conservation Institute, or MCI, represents a return to the original mission of CRL—collaborative research support for SI collections.

Staff
MCI’s work unites the arts and humanities with physical and natural sciences, and because its work is interdisciplinary, so too is its staff. The staff of 20 includes specialists in the conservation of paintings, furniture, textiles, and objects; inorganic and organic chemistry; biology and biodeterioration; metallurgy; engineering; microscopy; information technology; training; and administration.

Facilities
The MCI laboratories, located in the Smithsonian’s Museum Support Center in Suitland, Maryland, are equipped with advanced instrumentation, enabling staff to carry out a wide range of analytical techniques, including laser ablation inductively-coupled mass spectrometry, Fourier transform infrared and Fourier transform Raman spectroscopy, gas chromatography, pyrolysis-gas chromatography-mass spectroscopy, optical microscopy, scanning electron microscopy with energy dispersive and wavelength dispersive spectroscopy, xeroradiography, X-ray diffraction, X-ray fluorescence, X-ray radiography, and ultraviolet-visible light spectrophotometry. MCI also has equipment for the simulation of environmental and light-induced aging of materials, and for mechanical properties testing.
Activities
In fiscal year 2006, MCI collaborated with most of the Smithsonian’s museums and offices, and
with some non-Smithsonian organizations as well. All of these projects are summarized in this
document. Over the past year, 109 projects were initiated, continued, or completed. Half of
them were submitted by the museums and offices of the Smithsonian’s Under Secretary for
Science; the others originated with the museums and offices of the Under Secretary for Art (23
percent) or the Deputy Secretary and Chief Operating Officer’s museums and offices (27
percent). In addition to these projects, MCI held a lecture series on topics in museum
conservation, and was involved in numerous consultations and occasions of information
exchange.

Robert J. Koestler
Director

Museum Conservation Institute, Smithsonian Institution, Suitland, Maryland, Mar. 1, 2007, 134
pp.
Preface: MCI Overview

Staff

Freer Gallery of Art/Arthur M. Sackler Gallery (FSG)

- MCI 5912: LA-ICP-MS Study of Ancient Chinese Gold
- MCI 5998: 18th Dynasty Egyptian Wall Paintings
- MCI 6019: ICP-MS Analysis of Chinese Silver Archaeology Samples
- MCI 6037: Xeroradiography of Ancient Near East (Iran) Ceramics

Hirshhorn Museum and Sculpture Garden (HMSG)

- MCI 5865: Modern Paintings’ Media
- MCI 5866: "Number 2" Jackson Pollock Painting
- MCI 6010: Hirshhorn Museum and Sculpture Garden Exterior Wall and Balcony Moisture Problem

Museum Conservation Institute (MCI)

- MCI 5277: King Midas’s Tomb
- MCI 5769: Imaginería de Las Californias
- MCI 5789: Bust of Ennius Quirinus Visconti by David d’Angers
- MCI 5948: Research Project on Ivory Specimens
- MCI 5959: Research Project on Coatings for Silver
- MCI 5968: Lodge of Retirement, Forbidden City, Beijing, China, Embroidered Silks
- MCI 5970: Tibetan Thangka of Rjii Tsong-kha-pa
- MCI 6000: French Statuette of Mars
- MCI 6006: U.S. Marshals’ Badges
- MCI 6008: Lodge of Retirement, Forbidden City, Beijing, China
- MCI 6028: Kura-Araxes Ceramic Sherds
- MCI 6035: Fayette Co. (IN) Courthouse Ceiling Mural Painting
- MCI 6038: Etruscan Bucchero-Ware Footed Bowl Fragments
- MCI 6039: Field Recovery of Painted Organic Objects from the Site of El Perú-Waka’, Petén, Guatemala
- MCI 6040: Wootz Crucible
- MCI 6044: Wadi Rabah Culture (Jordan) Prehistoric Near-Eastern Ceramics
- MCI 6045: Kura-Araxes Ceramic Sherds
- MCI 6053: INAA of Excavated Pottery from Liangchengzen, China
- MCI 6054: Nine Metal Alloy Standards for GCI XRF Workshop Round Robin
- MCI 6055: Sinop Pottery from Northern Turkey
- MCI 6067: The Lodge of Retirement, Forbidden City, Beijing, China: Biological Conditions and Recommendations
- MCI 6068: Heavy Metal Pesticide Deterioration Collaboration with NMAI, NMNH, EPA, and NIST

National Air and Space Museum (NASM)

- MCI 5990: Wiley Post 1934 Pressurized Flight Suit
MCI 6012: Confederate Balloon Fabric
MCI 6026: NASM Floor Structure
MCI 6030: Air Handling Unit at Udvar Hazy Center
MCI 6056: Cessna 195 Acrylic Painting Condition Report and Treatment Proposal
MCI 6059: Conservation Specifications for Mannequin Construction
MCI 6060: Cessna 195 Acrylic Painting Treatment
MCI 6063: 18th-Century Wooden Chest
National Museum of American History (NMAH)
MCI 5877: Conservation Treatment and Technical Study of a Painted Portrait Pair of Mr. and Mrs. Shoup
MCI 5946: Painting Treatment Complete on Mrs. Tyler
MCI 6004: Benjamin Franklin's Silk Suit
MCI 6007: Analysis of Disfiguring Crystals on Columbian Bicycle
MCI 6016: Analysis of Crystals in a Metal Cabinet
MCI 6020: Brass/Copper Alloys in Astrolabes
MCI 6024: Painting: Benjamin Franklin, The Fireman
MCI 6032: Painting Conservation of Coeur de Lion
MCI 6033: Painting Conservation of Cable Ship Great Eastern
MCI 6034: On-site Examination of Five Paintings that were Tipped Over During Shipping from Philadelphia to NMAH, Washington, DC
MCI 6036: Gunboat Philadelphia
MCI 6051: National Museum of American History Renovation
MCI 6052: Storage Fabric for Military Uniforms
National Museum of the American Indian (NMAI)
MCI 5927: Coast Salish Blanket/Yarn
MCI 5972: Research Project on Salts in Ceramics
MCI 5979: Mixed Media Nootka Mask
MCI 5995: Tiny Protrusion of Bone Barb of Halibut Hook
MCI 5997: Analysis of Disfiguring Spot on Wooden Feast Bowl
MCI 6003: Pacific Northwest Coast Cedar Canoe
MCI 6011: Northwest Coast Potlatch Figure
MCI 6015: Glass Beads from Cree Plains of Prairie Woman’s Dress
MCI 6049: Technical Study of Wooden Mexican Shields and Mosaic Masks
MCI 6065: Stone Sculpture: Conquering Warrior
National Museum of Natural History (NMNH)
MCI 5814: Custom Manufactured Box with Lid to Store Photographs
MCI 5934: Rock Fragments with White Accretions
MCI 5943: Wood Samples from Mongolia
MCI 5951: Oil on Canvas Oversized Painting
| MCI 5974: Deer Stone Project, Hovsgol Aimag, Mongolia – Technical Study | 74 |
| MCI 5996: Analysis of Disfiguring Deposit on a Breech Cloth | 77 |
| MCI 5999: Khanuy Valley Project on Early Nomadic Pastoralism in Arkhangai Aimag, Mongolia | 78 |
| MCI 6001: Analysis of Archeological Food Residues in Artifacts from the Arctic | 79 |
| MCI 6005: Technical Analysis and Conservation of Two Copper Alloy Objects from Gol-Mod 2, Mongolia | 80 |
| MCI 6022: Rosebud Winter Count (Lakota Sioux) | 81 |
| MCI 6023: Tlingit Indian Robe and Knife | 82 |
| MCI 6025: Pakistani Garments | 83 |
| MCI 6027: Phytoliths and Starch Grains in Ancient Stone Tools | 84 |
| MCI 6042: Hawaiian Tapa | 85 |
| MCI 6047: Documentation of Mongolia’s Deer Stones 2006 Field Season | 86 |
| MCI 6048: Field Conservation for the Joint Mongolian-SI Deer Stone Project 2006 Field Season | 87 |
| MCI 6050: Fijian Masi (Bark Cloth) | 89 |
| MCI 6062: Documentation of Pre-historic Archaeological Textiles | 90 |

**National Portrait Gallery (NPG)**

| MCI 5952: Bust of Nathaniel Bowditch | 91 |
| MCI 5953: Bust of Benjamin Franklin Butler | 92 |
| MCI 5954: The Council of War Painted Plaster | 93 |
| MCI 5955: Bust of William Henry Seward | 94 |
| MCI 5956: Low Relief Bust of General George McClellan | 95 |
| MCI 5957: A Statuette after Clark Mills’s Andrew Jackson on Horseback | 96 |
| MCI 5958: Jean-Antoine Houdon’s Bust of George Washington (late 1780s) | 97 |
| MCI 5982: Bust of Samuel Gompers | 99 |
| MCI 5983: Bust of William Cullen Bryant | 100 |
| MCI 6017: On-site Conservation of Painted Frame of Indian Lady, Daughter of a Cacique | 101 |

**Office of Facilities Engineering and Operations (OFEO)**

| MCI 5833: Patent Office Building (NPG/SAAM) | 102 |
| MCI 5925: Particulate Materials Exhausting from Pod #3 at MSC | 103 |
| MCI 6031: Coolant Sample from NASM | 103 |
| MCI 6058: Four Seasons Bench | 104 |

**Office of the Under Secretary for Science (OUSS)**

| MCI 6009: Smithsonian Institution Building "SI Castle" | 105 |

**Smithsonian American Art Museum (SAAM)**

| MCI 5850: William Rimmer’s Falling Gladiator (1861) | 106 |
| MCI 5901: The Puritan by Augustus Saint-Gaudens | 108 |
| MCI 5964: A Statuette after Clark Mills’s Andrew Jackson on Horseback (latter half of the 19th century) | 109 |
| MCI 6002: American Appliqué Quilt (Center Medallion) | 110 |
MCI 6018: Calder Sculpture: Nenuphar
MCI 6041: Death of Cleopatra, Marble by Edmonia Lewis
MCI 6061: Roux Cabinet
MCI 6066: Portable XRF Demonstration

Smithsonian Institution Archives (SIA)
MCI 6013: Various Paper Documents and Enclosures
MCI 6014: Identification of Photo Negative Layers

Smithsonian Latino Center (SLC)
MCI 6064: Exhibit: Myth, Mortals and Immortality

Smithsonian Tropical Research Institute (STRI)
MCI 6021: Rock Samples from La Pintada Site, Panama
MCI 6029: STRI Library - Determine Level of Humidity
MCI 6043: Series of Gold Fragments from Objects in Cerro Juan Díaz, Panama
MCI 6046: Panama Viejo 2006 Archaeological Field School
MCI 6057: Pre-Columbian Collections from the Anthropology Museum of Panama

Topics in Museum Conservation Lecture Series
The Preservation of the Lodge of Retirement in the Forbidden City
Today’s High-Accuracy Laser Measurement Systems and their use in Inspection, Reverse Engineering, and Design Validation
EPA’s Tribal LifeLine™ Project: An Overview Calculating the Exposure and Risk to Tribal Communities from Chemicals in the Diet and Environment
Material Identification Using Raman Spectroscopy: Teeth, Bone, and Other Curiosities
The Sex Life of Cockroaches & Other Cautionary Tales
Chalcolithic Metallurgy: A Re-evaluation of the Chemical Composition of Nahal Mishmar Hoard by Portable XRF
Sensing Sensitivity: Assessing Light Damage Risks with Noninvasive Exposure Tests on Artifacts
Methodologies for the Analysis of Archeological Food Residues: Application to the Diet of Arctic People
The Mummy Portraits at University College London: Thirty Years of Conservation Research
William Rimmer’s Falling Gladiator: A Puzzle in More Ways than One
From Fabric Dyes to Fluorescent Paints: Care of Acrylic Paintings in Collections
The Prodigal Chairs
King Midas’ Golden Touch Rediscovered
Mural Paintings Research: State of Color Layers, Chemical Cleaning, and Retouching
Characterization of Synthetic Organic Pigments and Dyes, and Heterogeneous Natural Organic Pigments by Raman Spectroscopy
How Important are Biofilms in Conservation?

MCI Consultations
Staff

Mary W. Ballard, Senior Textile Conservator
Areas of interest: textile preservation, storage, and treatment.

Harriet (Rae) F. Beaubien, Senior Objects Conservator
Areas of interest: archaeological objects, on-site conservation; decorative arts.

Lynn Brostoff, Analytical Chemist
Areas of interest: ICP-MS and chemistry of museum objects.

Roland H. Cunningham, Senior Paintings Conservator
Additional studies: Institute of Fine Arts, Conservation Center, New York University
Areas of interest: inorganic characterization of paints, pigments, and archaeological materials; technical studies of artists' materials and techniques on canvas, panel paintings, and polychromed wood sculpture.

Paula T. Depriest, Deputy Director
Areas of interest: systematics, chemotaxonomy and molecular evolution of lichens, especially Cladoniaceae and Parmeliaceae.

Melanie E. Feather, Assistant Director for Operations
Areas of interest: application of electron and X-ray techniques to the study of art objects, archaeological material, and other museum specimens.

Martha Goodway, Metallurgist, Emeritus
S.B. (1958) Massachusetts Institute of Technology
Areas of interest: archaeometallurgy; the study of the traditional technologies of mining, smelting, refining, and forming of metals and their by-products in Europe, Egypt, and Southwest Asia; the metals of music.

Carol A. Grissom, Senior Objects Conservator
Areas of interest: sculptures in bronze, stone, zinc, plastic, and wood.
Walter R. Hopwood, Organic Chemist
B.S. (1966) University of Pittsburgh
Areas of interest: synthetic polymers and effects of commercial products on conservation treatments, museum display and storage, carbohydrate gums.

Robert J. Koestler, Director
B.S. (1972) SUNY Stony Brook; M.A. (1977) CUNY Hunter College; M.Ph. (1983), Ph.D. (1985) CUNY City College
Areas of interest: conservation science and collections preservation.

Francine T. Lewis, Management Support Assistant
Responsibilities: management/administration support, travel coordinator, internship/fellows/visiting scientist liaison, timekeeper.

Marion F. Mecklenburg, Senior Research Scientist
Areas of interest: mechanical properties of solid materials and the effects of environmental factors such as temperature and moisture; computer modeling of structures under static and dynamic loadings.

Karla Muñoz Alcocer, Imaginería de las Californias Program Specialist
Areas of interest: sculptures of religious representation of the Spanish colonial period from the southwest U.S. and northern states of Mexico; conservation of paintings and sculptures; colonial missions in the U.S. southwest and northern states of Mexico.

Ann B. N'Gadi, Technical Information Specialist/Webmaster
Additional studies: Westminster College (History); University of Pittsburgh (Archaeology); Anne Arundel Community College
Areas of interest: anthropology and archaeology; computer applications for information science and retrieval; Internet applications; public relations; publications and editing.

Beverly M. Smith, Assistant to the Director
Responsibilities: EEO officer; budget forecasting and administration; office manager; liaison for human resources, fellowships and grants, sponsored projects, plant services, design and construction.
Robert (Jeff) Speakman, Head of Technical Studies (as of Nov. 2006)
University of Missouri
Areas of interest: archaeology and museum studies of cultural heritage, development of
instrumentation for technical studies of cultural objects, and heavy metals in the environment. He
has several ongoing projects in Alaska, the American Southwest, the Northern Plains, the Andes,
and Northeast Asia.

Jia-sun Tsang, Senior Paintings Conservator
M.S. (1974) Chemistry, Bowling Green State University; M.S. (1985) Paintings Conservation,
Winterthur Museum, Art Conservation Program, University of Delaware
Areas of interest: collections care and preservation standards in museum exhibits; artists'
materials and techniques; characterization and surface cleaning of varnishes on paintings;
modern painting media and varnishes.

David W. von Endt, Senior Research Organic Chemist, Emeritus
Howard University
Areas of interest: application of organic chemistry to problems in museum conservation and
archaeology and to the study of natural organic compounds; chemical dating of archaeological
bones and teeth.

Melvin J. Wachowiak, Jr., Assistant Director for Conservation/Senior Furniture Conservator
University of Delaware
Areas of interest: history, characterization, and surface cleaning of coatings; wood technology
and anatomy; microscopy; training.

Donald C. Williams, Senior Furniture Conservator
B.A. (1985) University of Delaware
Areas of interest: furniture finishes and colorants.

Vernetta M. Williams, Administrative Officer
B.S. (1954) Howard University
Responsibilities: financial transactions, procurement, and property accounting.
Freer Gallery of Art/Arthur M. Sackler Gallery (FSG)

MCI 5912: LA-ICP-MS Study of Ancient Chinese Gold
MCI Project Staff: Lynn Brostoff

Several gold sheet fragments and gold-covered bronze plaques were submitted for technical analysis of the gold by ICP.

MCI 5998: 18th Dynasty Egyptian Wall Paintings
MCI Project Staff: Lynn Brostoff

Samples of 18th-Dynasty Egyptian wall paintings were submitted for painting cross-section preparation for XRD analysis.

MCI 6019: ICP-MS Analysis of Chinese Silver Archaeology Samples
MCI Project Staff: Lynn Brostoff

This work, which involves qualitative analysis using EDX and XRF, was undertaken as part of a technical study of excavated Chinese silver (probably a first outside of China). This project is part of a collaborative effort between the Department of Conservation and Scientific Research, Freer and Sackler Galleries, and the Department of Conservation of the Shaanxi Archaeological Institute, Xian, China. The samples of excavated silver are from a number of sites, some of which have yielded some of the most important examples of Tang Dynasty silver. FSG is unaware of any analyses of excavated silver from China that have been carried out in the West, and English publications on the results will be a first.

MCI 6037: Xeroradiography of Ancient Near East (Iran) Ceramics
MCI Project Staff: Ron Cunningham

This is the second part of a multi-phase project to xeroradiograph ANE ceramics in preparation for a catalogue and exhibition of the collection. The rate of completion is limited by the availability of funds for the TL analysis that must be completed prior to radiography. This group consists of 17 objects. (Part 1 was SCMRE #5849.)
Modern painting media were analyzed for pigment identification as part of a larger study on the paints used by Jackson Pollock. Inorganic analysis was done using EDS of dispersed material.

A shimmering substance was analyzed for pigment identification as part of a larger study on the paints used by Jackson Pollock. Inorganic analysis was done using EDS of dispersed material.
MCI 6010: Hirshhorn Museum and Sculpture Garden Exterior Wall and Balcony Moisture Problem
MCI Project Staff: Marion Mecklenburg

The water penetrating the walls of the Hirshhorn building is a result of the humidity level and the positive pressure of the building HVAC system. The penetration is largely localized in the area of the balcony where creep has settled that portion of the building and seams have opened. Interior wall penetrations may also be a source of moisture; it may be the result of electrical outlets and track lighting breaking the wall integrity.

![Image of the Hirshhorn building with moisture issue]

Probable deflection of structural floor over the balcony

This schematic shows the possible deflection of the structural flooring above the Hirshhorn’s balcony. This shape of deflection can explain the locations of the open seams at the area of the balcony, and can also explain why the leaks are largely localized in the balcony area.
Museum Conservation Institute (MCI)

MCI 5277: King Midas’s Tomb
For the Gordion Furniture Project, The University of Pennsylvania Museum of Archaeology and Anthropology
MCI Project Staff: Mary Ballard, Lynn Brostoff, Roland Cunningham, Walter Hopwood, Joseph Koles

According to legend, Midas was the king who could turn anything into gold. In 2003, MCI (then SCMRE) was approached by co-authors Professor Elizabeth Simpson and objects conservator Kryśia Spirydowicz for assistance in the analysis of 11 textile samples from the prominent Tumulus MM at Gordion, Turkey—widely considered to be King Midas’s tomb.

Despite the tomb’s pristine and methodical excavation by the University of Pennsylvania (1957 and onwards), no gold was ever found inside it—there was bronze, iron, and exquisite inlaid furniture, but no gold. There was to be a new book on the furniture and other artifacts found in the tomb and the textile fragments associated with the bier. A succinct appendix on the textiles was sought.
At first glance, the textiles were unimpressive—either degraded clumps or small fragments, such as the one in the photograph, in which uneven weaving and knots were hardly of regal quality. At high magnification, the fibers were found to be hollow—with no organic material left. What appears as yarns seemed simply the artifact of a uniform coating, entirely hollow, as seen with SEM/EDS, and composed of iron.

Pseudomorphs or fossils of textile fibers occasionally appear adjacent to metal archaeological artifacts with some preserved organic residues. After washing off microbial debris with solvents, an organic infrared spectrum was taken. It matched “Goethite” a gold-colored iron oxide (α-FeOOH), which in turn matched a recently published textile study.
A senior textile scientist at Milliken Research Associates (South Carolina) had discovered a process that rendered polyester electrically conductive by coating it with iron oxides—precipitating a uniform, permanent, non-corrosive coloration on the entire fiber surface: hematite, magnetite, or Goethite.

While the FTIR spectra matched, because both were oxides, it was not definitive proof. Various other innovative analytical systems were employed, unsuccessfully, to prove the link between the Tumulus MM textiles and Goethite. These included 13 different Raman spectroscopy procedures. The samples were subsequently analyzed with a TerraSpec VIS/NIR spectrometer which gave a definitive peak at 760 nm, in the near infrared, and proved the close similarity of Goethite in the Midas sample, its match to the modern polyester-coated linen, and a known reference spectrum. King Midas’s treasure has been discovered behind the scenes at the Smithsonian Institution.

Three samples of Goethite: (1) on modern polyester (light-yellow background), (2) on modern linen to the right, resting on the modern Polyester, and (3) 800 BC Tumulus MM Goethite sitting on glassine envelope (M. Ballard).

Other fragments from the tomb, once thought to be green because of their proximity to the copper and bronze artifacts, have been proved to be composed of indigo and goethite—a sophisticated mixing of organic and inorganic chemistry. The Lydian king buried so long ago reigned over a kingdom filled with very capable scientists and textile technologists.
MCI 5769: Imaginería de Las Californias
Early 18th Century Polychromed Wood Sculpture
MCI Project Staff: Karla Muñoz-Alcocer and MCI staff

**Imaginería de Las Californias**
This work was undertaken to determine the technique and materials of manufacture for 100 sculptures. Differences and similarities between sculptures were established both on a visual and a structural level, hypotheses were made about possible local production at the missions or in regional colonial cities, and Spanish and native influences on design and construction were looked at.

**Misiones Coloniales de Chihuahua**
Project objectives included promoting research and disseminating information about the missions and their artwork, as well as restoring, preserving, and protecting their buildings and other Spanish colonial heritage. The project emphasized exchanging research and conservation techniques between institutions and experts working on Spanish colonial architecture in the U.S. southwest.
Santa María de Cuevas Colonial Mission
MCI served as a partner conducting materials analysis and conservation treatment design for the decorative ceiling and walls. Technical analysis results will aid in historic reconstruction of the mission.

The specific goals of this study were:

1. Determine the similarities between Santa Maria de Cuevas’ painted ceiling and two other ceilings, the Huejotitan Altarpiece and the Santa Ana Choir ceiling.

2. Technically examine two Spanish colonial religious sculptures; a pair of “custodian angels.” Since these are a pair, and they look alike, it has been assumed that they were made at the same time. Both of them are at the Spanish colonial mission of Santa Cruz and are displayed as they were believed to have been for 300 years. Comparison of technical data between them may determine if, in fact, the two angels were produced by the same workshop.

In addition to the field work, four painted wood panels will be reproduced at the MCI Furniture Conservation Lab. Several techniques and materials will be tested and a reproduction of the technique that most closely follows our theory will be done as well. Samples will be taken from these panels compared with those we have from Santa Maria de Cuevas ceiling.
The bust of Ennius Quirinus Visconti by David d’Angers was submitted for analysis to determine the metal. SEM-EDS and ICP analysis confirm that, contrary to the understanding of the sculptor, the bust was cast in lead alloyed with small amounts of tin and zinc.
MCI 5948: Research Project on Ivory Specimens
MCI Project Staff: Odile Madden, Walter Hopwood

This project is testing the hypothesis that DNA from ivory objects can be used to identify the ivory source as to animal group, species, and geographic region.

MCI 5959: Research Project on Coatings for Silver
MCI Project Staff: Carol Grissom, Nicole Grabow, Corey Smith

This research was done to determine the sulfur permeability of several organic coating materials as a first step in assessing their suitability as protective coatings for silver artifacts in indoor environments. Eleven different coating materials and one uncoated control were tested. The coatings were applied to sterling silver coupons in solvent mixtures appropriate to each polymer. They were allowed to dry completely (dryness was determined based on weight), color measurements were taken from all sample coupons with a colorimeter, and visual observations were recorded. The samples were then subjected to a high-sulfur environment for three to seven days. Color measurements were taken again, and observations made at intervals during and after the sulfur exposure. The samples were assessed according to their degree of change.
MCI 5968: Lodge of Retirement, Forbidden City, Beijing, China, Embroidered Silks
For the Palace Museum, Beijing, China
MCI Project Staff: Mary Ballard

The embroidered silks in question have fine particulate soiling, dust that has migrated into the fibers. Such soiling resembles the smoke residue from a fire – soot deposits – which are most effectively removed by a combination of the following: mechanical action (gentle, low-suction vacuuming followed by gummy dough/erasers), solvent action to remove any grease or oil component that might cause particulates to adhere, and aqueous detergent treatment to suspend the soil and carry it away in the rinse. The fibers are now weakened with age, so all of these actions must be modified to take that into account.
The Tibetan Thangka was examined and a condition report was made concerning the fabric borders and veil, as well as fabric stability and strength with respect to self-support on its dowels.
MCI 6000: French Statuette of Mars
In collaboration with Winterthur Art Conservation Program, University of Delaware
MCI Project Staff: Carol Grissom

A zinc statuette was examined by X-radiography to better understand the French fabrication techniques and to compare it to a French zinc statuette being treated. The statuette being examined was slush-cast in four main parts that were soldered together, based on close examination and confirmed by X-radiography. Despite the fact that the statuette is almost certainly one of many replicas and was probably inexpensive at the time of its original purchase, it is finely made and displays high-quality fabrication and finishing.
Seven badges (three U.S. Marshal, two deputy sheriff, and two Pinkerton) found on private property in Izard County, Arkansas, were brought to MCI by the historian of the U.S. Marshal Service for advice on authenticity in anticipation of possible purchase for a future U.S. Marshal Museum. The owners believe that the badges were buried as part of a shrine to the James-Younger gang. Names inscribed on the backs of two Pinkerton badges and one deputy sheriff’s badge corresponds to those of men killed by members of the James-Younger gang. Jesse James taught school near Izard County, creating a connection to the area, although the gang hailed from Missouri.

Examination and analyses performed at MCI indicated that it is highly unlikely that these badges represent authentic trophies of the James gang. X-ray fluorescence spectroscopy confirmed that the primary constituent of the base metal of all the badges is copper and that silver-colored plating contains nickel (on five badges) or nickel and small amounts of silver (on two badges). While nickel-plated copper was technically possible during the 19th century, silver was more typical for badges. More pertinent to authentication is the fact that all seven badges showed nearly identical compositions, which is implausible for the five different types represented among them. Only two types of pins were used for attachment, and all pins proved to be made of silver-plated brass. These similarities are also implausible for a disparate group of badges. Close examination indicated that the badges were artificially rather than naturally aged. Finally, high-powered magnification using conventional microscopy and scanning electron microscopy showed that names inscribed on three badges were made with the same tools. Thus, these badges were made by the same person at the same time.
SEM images of badge surface (R. Cunningham)
MCI 6008: Lodge of Retirement, Forbidden City, Beijing, China  
Determine needs, if any, of internal humidity and temperature controls for World Monuments Fund  
For the Palace Museum, Beijing, China  
MCI Project Staff: Marion Mecklenburg

It is important to address all conservation issues pertaining to the Lodge building and its contents—including roofing, windows, and waterproofing—and to determine if any internal humidity and temperature controls are needed. The following are general guidelines for looking at these issues in the Lodge of Retirement and any other building in the Forbidden City.

1. Conduct a 3-D scanner survey. Then produce a very accurate set of drawings of the entire building, especially a separate set of drawings of the structure, detailing every load-bearing member.
2. Conduct a very careful structural analysis of every load-bearing member, including the columns, beams, joists, etc.
3. Calculate the maximum capacity of every load-bearing member and compare the maximum capacity to the actual load on each. It is possible to calculate a “factor of safety” for every structural member of the Lodge of Retirement by taking the maximum capacity of each member and dividing it by the actual load on each member. For example one column that was analyzed for the Lodge of Retirement was found to be carrying only carrying 15-20% of its capacity. So the factor of safety of the column is between 6.7 and 5.
4. Conduct a careful examination of each load-bearing member of the temple and get an accurate estimate of the member’s capacity to continue as a working structural member.
5. Check the roofing system for water leaks and repair requirements. Then correct all structural and roof defects and begin to focus on the decorative aspects of the building.
6. To help identify decorative materials, in addition to physical analysis, historical documents may help, if they are available. Then restoration can begin.
7. Establish the best HVAC system for the building, the objects, and the decorative surfaces.
Three-dimensional representation of the Lodge of Retirement, Forbidden City, Beijing, China
MCI 6028: Kura-Araxes Ceramic Sherds
For University of Arizona/ University of Chicago
MCI Project Staff: Ron Cunningham

The purpose of this xeroradiographic analysis was to determine the method and sequences of manufacture and the pattern of variability. The results were then compared to Pamela Vandiver’s results for other Near Eastern sites of the same period. This research follows a pilot study completed in 2002 that is in publication with credit to MCI.

MCI 6035: Fayette Co. (IN) Courthouse Ceiling Mural Painting
Provide advice and guidance to conservation project
Request via the Secretary of SI
MCI Project Staff: Jia-sun Tsang

The scope of the work included finding the best approach or procedure for the restoration of the ceiling mural painting, suggesting links to professional and community organizations, and helping to assess the content and cost of project proposals, as well as the option of retaining MCI as a technical consultant.
Fayette Co., IN, Courthouse, details of interior surfaces
MCI 6038: Etruscan Bucchero-Ware Footed Bowl Fragments
Xeroradiograph
For University of Arizona
MCI Project Staff: Ron Cunningham

Three bowl fragments were xeroradiographed to analyze the manufacturing technology for conservation treatment research.
MCI 6039: Field Recovery of Painted Organic Objects from the Site of El Perú-Waka', Petén, Guatemala

For Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala, Universidad San Carlos, and Southern Methodist University
MCI Project Staff: Rae Beaubien, Leslie Weber

While it is assumed that objects made of painted wood, gourd, and other organic materials were produced and used in ancient Mesoamerica, information about them has relied largely on much later ethno-historical records dating from the time of European contact and beyond. Archaeologically, these types of objects are rather rare, with find spots almost exclusively in burials where the deposits have been relatively undisturbed. The reason for their scarcity in museum collections is that they are typically found as concentrations of paint fragments without any substrate. The substrate materials are presumed to have been organic materials because of the totality of their degradation, a condition not surprising in a subtropical environment. When found, these deposits have usually been recorded as unidentified objects, the fragments gathered as loose material, and the finds avoided as a subject of study because of their fragility and the daunting task of reconstructing anything meaningful from the fragments.

Over the past 15 years, MCI conservators (Beaubien, along with MCI conservation fellows and interns) have assisted several archaeological projects that encountered such deposits in the course of excavation, providing opportunities to test a variety of conservation methods in the field (beginning with recovery), and to study them hand in hand with the subsequent stabilization and conservation treatment. As a result, the fragments have provided new data about original substrates, decorative schemes, and in some cases original forms. Paint samples, analyzed where permitted, have yielded information about painting materials and techniques, some of which were not previously known. In the process of these activities, MCI conservation fellows gained specialized experience in field techniques, and archaeological project members received training in basic conservation approaches.

In 2005, excavations at the site of El Perú-Waka' – located in the epicentral region of the ancient Maya world – uncovered an elite burial in Early Classic levels of a pyramid/temple complex (250-600 AD). The skeletal remains of two female individuals (one of whom was pregnant) were found, along with burial offerings of ceramic vessels and three painted organic objects, the latter surviving only as collapsed deposits of paint flakes. The Guatemalan-U.S. archaeological team, under the direction of Drs. Hector Escobedo (Universidad San Carlos) and David Freidel (Southern Methodist University), lifted all but the paint flake deposits, leaving them for the 2006 field season.

The MCI conservators joined the team for a week to stabilize in situ and then lift the deposits, so that they could be transported safely to the project’s laboratory in Guatemala City. For the first time with these kinds of objects, the conservators applied a relatively new conservation material – cyclododecane – which offers great promise for use with extremely fragile archaeological finds. This material effectively immobilized and protected the paint flakes, so that each consolidated deposit could be jacketed with plaster bandages for lifting. Prior to consolidation, the objects were cleaned, and relatively undisturbed fragment groups were stabilized with application of tissue facings. Later in the field lab, the objects were cleaned further and jacketed; they are now ready to be safely moved and stored for future study.
Beaubien being lowered into the burial chamber
Weber jacketing a paint deposit, following stabilization with cyclododecane

Burial floor, with one paint deposit (untreated) at the far end, and another (after plaster jacketing) in the foreground (left image). Three paint deposits in the field lab, fully protected for transport, storage, and further study
The inspiration for Benjamin Huntsman’s so-called invention of crucible steel, dated to 1740, is now generally conceded to have been the observation in India of the making of “wootz.” This is traditional steel made by converting bloomery iron to steel in a sealed crucible. Among a number of detailed 19th century eyewitness accounts of wootz-making in India there is one from the village of Gattihosahalli. Neither the temperature of the process nor the material of the crucibles are specified in this account.

Work in MCI has already established the temperature (CAL 5569). Sherds of used crucibles were collected from Gattihosahalli and samples of these sherds were refired to measure the maximum temperature each had reached. The process temperature and its working range were found to be substantially lower than all prior estimates.

The next step is to determine what these crucibles were made of. An intact, unfired crucible from Gattihosahalli is available for sampling. This crucible has already been radiographed and xeroradiographed in MCI. Xeroradiography revealed that it was not thrown but made over a form by sequential slab construction. The method of fabrication may have been chosen simply to avoid the mechanical complexities of a wheel. More likely it was due to a lack of plasticity in the clay as a result of refractory components, but we do not know what these are.

Elemental analysis by EDAX and XRD for mineralogical identification was requested, although only a small amount of sample is available, limiting the number of spectra and patterns that can be made.

The temper is most likely quartz but the clay fraction may prove more difficult to identify. Jeffrey Post, chairman of the Department of Mineral Sciences, has already volunteered to collaborate on analysis of the data.
At the end of the Pre-Pottery Neolithic (approximately 6500 BC cal) settlement patterns in the southern Levant changed. In many areas, large, densely populated villages were replaced by small, dispersed hamlets and farmsteads. As this shift was coincident with the emergence of pottery, archaeologists interested in the Late Neolithic period have emphasized ceramic materials when defining cultural units and addressing the complex chronological issues that characterize later prehistory. The bulk of this research has focused on pottery decoration and vessel shape, or more rarely, raw material selection. Unlike Neolithic pottery from other regions of the Near East, forming techniques have not been a focus of intensive study.

Our understanding of the nature and extent of interaction between Late Neolithic settlements would benefit from a more complete consideration of how pottery was made. Were the knowledge and skills used to make pottery shared between sites? Or were they more localized? Archaeological work in Wadi Ziqlab, Jordan, has produced material that allows us to address these questions. Wadi Ziqlab is one of several tributaries of the Jordan River that drain the western part of the Irbid plateau in northwestern Jordan. The Wadi Ziqlab project, under the direction of Professor E.B. Banning of the University of Toronto, has surveyed much of the wadi and has conducted excavations at several sites, including ones that produced Late Neolithic pottery.

The pottery from these sites exhibits some common elements. It all tends to be soft and friable, with inclusions consisting primarily of limestone. The sites have many forms in common, such as simple bowls and “holemouth” jars. The low frequency of decoration is also a consistent feature. Other elements are not shared between sites, including specific vessel forms and particular surface treatments.

Xeroradiography can be used to determine whether particular forming techniques were also shared between sites. Since complete vessels are not available for study, a sample of 90 sherds, primarily from the two most extensively excavated Late Neolithic Wadi Ziqlab sites (WZ 135 and 200), has been selected for xeroradiographic analysis. At one of these (WZ 200), multiple phases of Late Neolithic occupation have been identified, and sherds were selected to reflect the full temporal range. Therefore, insights into technological change over time may also be observed through the analysis. The results of this work will augment stylistic and petrographic analyses that are being conducted as part of a University of Toronto Ph.D. dissertation.
MCI 6045: Kura-Araxes Ceramic Sherds
Xeroradiograph
For University of Chicago
MCI Project Staff: Ron Cunningham

This is a follow-up to recent xeroradiography of Kura-Araxes wares. Images of about 50 pottery thick sections were needed to determine the exact nature of joins in slab manufacture. The analysis looked at pattern of variability and compared results to Pamela Vandiver’s results for other Near Eastern sites of the same period. This research follows a pilot study completed in 2002 that is in publication with credit to MCI.

MCI 6053: INAA of Excavated Pottery from Liangchengzen, China
For University of Arizona
MCI Project Staff: Pam Vandiver

Pottery from Field Museum and Shandong University excavations at Liangchengzhen, Rizhao County, Shandong Province, China, was submitted for INAA (instrumental neutron activation analysis) of clays and pottery of three shape classes from five pits, each containing debris from a single banquet event. Trace element analysis was used to investigate the variability of fabric from a group of pits with debris from banqueting in shapes of bowls, tripod cooking and serving vessels, and goblets or drinking vessels.

Among earliest pottery thrown on a potter’s wheel in China, these loessic clays were fired from 800 to 1050°C, thinned sometimes to eggshell thickness, and finished by turning and burnishing on a wheel when the clay was dry in a manner similar to worked jade vessels. SEM analysis of turning marks shows 80-micron horizontal grooves of a regularity that would have required a lathe-turning method.
This project was initiated in order to allow MCI staff to participate in the Getty Conservation Institute’s XRF Workshop – Part III, Quantitative XRF Analysis Using Handheld Instrumentation, in July 2006. This workshop was attended as part of professional training for the primary user of MCI’s instrument, an Innov-X Model 442 portable X-ray fluorescence spectrometer (XRF), and also to initiate comparison between instruments held within the Smithsonian Institution. One of MCI’s goals is to develop better methodology in the use of portable XRF for analysis of museum objects and art materials.

The GCI provided nine “round-robin” metal standards of unknown composition to each participant ahead of the scheduled workshop. Analytical results were produced by staff from the participating museums on various types of XRF systems, and results were compiled by GCI for comparison and discussion at the workshop. Results show that the data produced by the primary XRF analyst at MCI, Lynn Brostoff, compares very favorably to those of other instruments for the four copper-colored alloy standards. The round-robin samples also included four lightweight, silver-colored standards, which appear to be aluminum. Due to lack of purging or vacuum capability, the Innov-X XRF is unable to detect light elements such as Al, Si, or Mg. However, using the XRF in the soil mode, which is optimized for light element matrices, and by making assumptions about the make-up of the “balance” counts, it is shown that the composition of detectable elements can be approximated reasonably well in these cases. Complementary analyses by XRD and EDS are shown to be useful to confirm that the silver-colored alloys are aluminum-based; EDS also provides acceptable compositions for all samples.

Comparison of the MCI Innov-X and the NMNH Niton XRF units showed fairly good correspondence between the instruments for two of the round-robin samples, as well as three NIST soil standards. Some differences in results, especially with regard to limits of detection and accuracy, were noted. Use of the soil mode is also shown to be helpful on the metal standards for qualitative identification of some trace elements below detection limits in the alloy mode. However, care must be taken in interpreting these results, which sometimes appear to be unreliable or ambiguous. Identification of trace elements in metals, as well as soils, should be confirmed by other means.

The GCI workshop also included exercises that demonstrate sources of error in measurements, including: scattering from separation materials, poor signal-to-noise ratio, spectral interferences, and effects on Pb from varying depth of penetrations into a sample. The results of the workshop confirm experience that although standard materials may be quantitatively analyzed with relative accuracy, analysis of art objects and materials may introduce complications that render analyses for the most part qualitative in nature. The exception to this rule is the analysis of bronze materials, which often yields good quantitative results. The GCI workshop will serve as a model for a series of planned workshops on portable XRF methodology for Smithsonian XRF users.
MCI 6055: Sinop Pottery from Northern Turkey
Xeroradiograph
For University of Washington
MCI Project Staff: Ron Cunningham

This project exposed Sinop pottery from Northern Turkey to X-rays using xeroradiography equipment. The parameters of the X-rays were 20 kV for 15 seconds at standard height. Only exposures were specified, as no film or analytic results were required to test effects of X-rays on luminescence properties.
MCI 6067: The Lodge of Retirement, Forbidden City, Beijing, China: Biological Conditions and Recommendations
For Palace Museum, Beijing, China
MCI Project Staff: Robert Koestler

A prior visit to the Lodge, in 2002, revealed extensive insect activity and live carpet beetle larvae. A number of recommendations made at that time have been implemented by Palace Museum staff, including removal of wall coverings from damaged areas to facilitate examination for live insects underneath the coverings. During a 2005 visit, no live insects were found on the walls. New recommendations include: completion of wall-covering removal, HEPA-vacuum cleaning to remove all dust and dirt, application of a topical insecticide to exposed walls, and monitoring of subsequent insect activity with sticky traps.

Surface remains of insect activity on northwest wall, Lodge of Retirement, Forbidden City (R. Koestler)
In this project, MCI staff prepared and tested standards for arsenic, mercury, and lead. The goal was to provide quantitative calibrations for portable, handheld nondestructive X-ray fluorescence spectrometers and other methods for detection and analysis of toxic residues on National Museum of the American Indian and National Museum of Natural History collections, and associated materials. Analytical tools used included portable X-ray fluorescence (XRF), X-ray diffraction (XRD), inductively coupled plasma-mass spectrometer (ICP-MS), and scanning electron microscope (SEM) instruments at MCI, NMAI, and NMNH. The standards and protocols assessed the level of heavy metal pesticides—arsenic, mercury, and lead—on highly sensitive collections—i.e., American Indian objects that may be subject to repatriation. Work was conducted in collaboration with the National Museum of the American Indian, the National Museum of Natural History, the National Institute of Standards and Technology, the Environmental Protection Agency, and the University of Arizona and Arizona State Museums.
National Air and Space Museum (NASM)

MCI 5990: Wiley Post 1934 Pressurized Flight Suit
MCI Project Staff: Mary Ballard

The pressure suit worn by test pilot Wiley Post was also designed by him in 1934. After years on display, the suit has acquired stains, discolorations, and tears. It no longer conforms to the stance with which Wiley Post graced it. This ongoing project will remove the wood mannequin, long underwear, and rubber suit, treating the cotton outer suit.

Wiley Post was the first to test a pressure suit (NASM credit); current staining, deterioration

Because of the diverse types of stains and materials (leather reinforcements, metal reinforcing rings), the unprimed cotton duck fabric will be treated locally and specifically. The rubber suiting shows the deterioration that oxygen, and especially ozone (O3), can produce on natural vulcanized rubber. An associated project on anoxic storage planned by MCI and the Cooper Hewitt may assist in the storage of these materials.
MCI 6012: Confederate Balloon Fabric
MCI Project Staff: Mary Ballard

A proposal was submitted to remove a Confederate balloon fabric from its support, complete a technical examination, and remount the fabric. The project is continuing.

MCI 6026: NASM Floor Structure
MCI Project Staff: Marion Mecklenburg

The general cracking of the floor in Gallery 102 in NASM was a result of overloading during the installation of new exhibits without auxiliary supports in the parking area below. The area designated as E-F, 3-3.1 contains extremely wide cracks (up to 3/8 inches) caused by the installation of a column 1” too high. As a result, the support beams in that area are 1” too high and the floor slab is 1” too thin. This results in a reduction in bending strength of the concrete floor slab of 21.6%. 
MCI 6030: Air Handling Unit at Udvar Hazy Center
Develop solution to resonant cracking
MCI Project Staff: Marion Mecklenburg

The report summarizes the history of the supply fan failures, possible reasons for those failures, and possible retrofit solutions. The basic analysis suggests the spring isolation system is too flexible, allowing for large support frame deflections. Those deflections allow the heavy fan, shaft, and sheave assembly to develop precession force at the shaft bearings. Those forces cause larger frame torsional deflections that result in the fatigue fracture of the frame members.

Typical supply AHU at the Udvar-Hazy Center, NASM

Typical upper thrust spring and attachment bracket for the supply AHU
MCI 6056: Cessna 195 Acrylic Painting Condition Report and Treatment Proposal
MCI Project Staff: Jia-sun Tsang

This painting was hung high in open space on the wall in Garber Facility, Building 10, where NASM restoration and preservation offices are located. This huge space is utilized for aircraft restoration and preservation, among other functions. Sporadically, small flying objects such as insects and birds are trapped in the large building. The collection managers noticed their droppings on this painting; therefore, it was brought down for a condition survey and treatment proposal.

The painting is constructed of acrylic paints using airbrush techniques. The thermoplastic nature of the acrylic paint film results in significant adhesion of dirt and grime to the surface. The cleaning of surface dirt and other containments from acrylic paintings is difficult. This conservation project addressed the technical issues of cleaning, laid out a conservation treatment plan, and discussed recommendations for storage/display.

*Cessna 195* by Clarence Measelle, 1977 (NASM)
Mannequins are custom-made to fit the stance and posture of particular garments in the Smithsonian museums and, of course, their unique size. It is rare that a division of a museum relies on only men’s “36-Regular” or women’s “size 8” for its holdings. Yet despite the number of expertly tailored mannequins, no review of the composition of ethafoam mannequins in use across the Smithsonian museums existed when the NASM conservation department was asked to provide a set of specifications, and in turn, MCI was asked to develop it. With the help of NMAH’s preservation services, Department of Costume, and the Office of Exhibits Central, a standard set of specifications was prepared that is acceptable across the Smithsonian museums.

Non-museum-quality mannequins

Materials that outgas and cause discoloration (irreversible yellowing) or deterioration, have to be removed from mannequins used in museums.
MCI 6060: Cessna 195 Acrylic Painting Treatment
MCI Project Staff: Jia-sun Tsang

The conservation tasks were to examine and document the materials and condition of the painting and to remove bird droppings and fly specks. In addition to conservation treatment, an in-depth investigation of conservation resources and vendors is leading to specifications and a prototype for display and exhibition of all oversize acrylic paintings at NASM.

A shadow box made with UV-filtered Plexiglas is recommended to cover the painting and protect it from pollutants. Recommendations address aesthetic aspects of displaying the painting, cost concerns of building a Plexiglas cover, and preventive care of this large acrylic painting. This box can also be used in storage, packing, and shipping, providing further protection in these circumstances.

The box should be 2 inches larger than the painting on all sides, to accommodate the height of the stretcher or molding. It should be free-supporting—not screwed into or otherwise attached to the painting’s existing frame. The box should be hung directly on the wall. Two bids from SI exhibition facilities and two bids from outside contractors were submitted, and evaluation by NASM and MCI is underway.
Jia-sun Tsang, MCI Senior Paintings Conservator, evaluated the limitation of surface cleaning on Cessna 195.

This project was conceived as a collaboration between a NASM conservation scientist and an MCI senior conservator under the guidance of the NASM conservation director; it is part of a long-term MCI/NASM project involving surveying and conserving fine art collections at NASM. Jia-sun Tsang, senior paintings conservator at MCI, provided the supervision and training for the conservation scientist at NASM, in examination, documentation, and treatment—minor stain removal and inpainting of this painting. The short-term goal was to conserve the Cessna 195 so it can be displayed in a safer environment within a proper wall-case display. The long-term goal was to assist NASM in establishing guidelines and policies in the care of its paintings and other fine art, building that museum’s in-house capability.
This and related furniture was infested by powder post beetles and subsequently fumigated. Available information would support preventive conservation strategies, such as plugging old flight holes with wax. Insect identification was requested. Webbing cloth moth, spider, and unidentified insect fragments were identified, but no wood borer larvae were found.
National Museum of American History (NMAH)

MCI 5877: Conservation Treatment and Technical Study of a Painted Portrait Pair of Mr. and Mrs. Shoup
MCI Project Staff: Sarah Pinchin, Jia-Sun Tsang

These two paintings, together, are an exquisite example of traditional American portraiture. This large portrait pair is a particularly captivating part of the collection of the National Museum of American History’s Division of Domestic Life. They are given the date of 1800 in the Smithsonian American Art Museum Art Inventories Catalog but are probably later, c. 1820. The artist is unknown. No signature or markings of any kind are on the canvas or frame. They are known as Mr. and Mrs. Shoup. Shoup was a common name in 19th century America, and nothing more is known about the sitters.

Both paintings were in need of treatment, and the treatment did effectively resolve many of the issues concerning these paintings. On first examination and during the treatment, questions arose as to whether the two were actually originally a pair. The treatment of the paintings dealt with their individual features, but it was always considered that these two would be exhibited as a unit. Cleaning and removal of the disparate varnishes have now made the two paintings seem unquestionably a pair.

The pair are now ready to be exhibited and have been secured against additional damage. All procedures (including the extent of the retouching using ultraviolet light) have been documented.
The treatment resulted in an overall improved condition and appearance of this painting, while maintaining the value and historical merits of the portrait. The physical distortions and slackness of the canvas were minimized. The discolored cracked varnish was reduced. A new application of a surface coating saturated the colors in a way that complemented the traditional appearance of this period of painting, matching vivid colors and surface quality of the triangular sections that were not exposed to light. The fundamental goal throughout the procedure was that the integrity of the painting should remain intact. A treatment proposal was made for the frame of Portrait of Julia Gardiner Tyler.
MCI 6004: Benjamin Franklin's Silk Suit
MCI Project Staff: Mary Ballard

In honor of Benjamin Franklin’s 300th birthday, the silk suit held by the National Museum of American History (belonging to the Massachusetts Historical Society) was taken out of storage in preparation for display and for patterning a reproduction. The tailor handling the pattern-making and reproduction used white cotton gloves but the dye crocked onto his gloves! It appears that the suit was painted over with ink. In addition, the suit is very stained and discolored.

Sunae Park Evans and Mary Ballard measure the color of the suit at registered places.

Although the suit was scheduled for display for only one month, museum exigencies extended this for two additional months. After the exhibition ended, the suit was re-measured to ensure that it had not faded beyond its initial problems.

The tristimulus colorimeter divides color into three categories: lightness/darkness, redness/greenness, and blueness/yellowness (left image). The suit’s weave has small horizontal stripes and vertical bands—cannetillé and louisine with two lisières—deceptively simple in appearance but complex to weave.
About six months after being moved from storage in the Smithsonian’s American History building for display in the west room of The Castle, white crystals developed on the oldest portions of the bicycle, namely the handle grips, which date from about 1895. These tan-colored grips may be described as imitation leather and are similar to other items in the collection known, or suspected, to be Bakelite, a urea-formaldehyde resin that often contains 25 to 75 percent cellulosic fillers such as wood flour or rag cuttings. Infrared spectroscopy suggested that the crystals are ammonium sulfate. This substance has the unusual property of forming on a surface in a water droplet from air pollutants such as ammonia and sulfur dioxide and then expelling all water to form a stable unhydrated crystal. Therefore, changing ambient relative humidity and air currents are crucial elements in formation of the crystals.

The bicycle is displayed near the west wall and is elevated about halfway toward the 40-foot-high ceiling. The handle grip farthest from the wall has a greater mass of the crystals than that located just next to the wall. There are several possible contributors to air pollution at the location, including rug shampoos (and other cleaning agents) and fuel emissions. The nature of the surface on which crystallization occurs is crucial but poorly understood. Two instances in the literature document formation on picture varnishes in the National Gallery, London, and on documents in American archives.
Objects undisturbed indoors for many years, upon close examination, are found to have developed white deposits that are distinguishable from dust. When subjected to analysis, about half of them show the presence of organic acids and/or metallic salts of organic acids. There are at least three ways that the fatty acid deposits can develop. Bare wood, basketry, and cardboard may exude fatty acids. Theoretically, the organic acids have a more stable pure form on the surface and a less stable combined form in the interior of such porous materials. Changes in relative humidity and temperature are thought to drive actual exudation. A second way these crystals can form involves residues of cleaning products on waxed, varnished, or painted surfaces. Organic acids in the liquid cleaners left as a film may slowly coalesce into crystalline form. A third way the crystals form is by corrosion of bare metal by volatile organic acids. Wood is a common source of volatile acids but there are many others. In the most recent instance, crystals of organic acids were discovered on a metal cabinet containing vials of corn, synthetic dyestuffs, and other collectibles. Liquid cleaners may have been the main source of the deposit. The cabinet was being taken out of service when the deposit was discovered.
MCI 6020: Brass/Copper Alloys in Astrolabes
Portable XRF analysis of various astrolabes
MCI Project Staff: Aaron Shugar

The purpose of the analysis was identification of chemistry, in order to investigate the authenticity of several parts, to look at the development of brass production technology, and to provide detailed information for updating catalogues.
NMAH is the recipient of the unparalleled gift of the CIGNA collection of firefighting and maritime history objects containing nearly 4000 pieces of art and historical artifacts, with some dating back more than 250 years. The painting of *Benjamin Franklin, The Fireman* is prominently displayed in the exhibit to highlight the new acquisitions. Franklin was among the first to organize volunteer firefighting companies in Philadelphia, and this painting features him wearing a fire helmet.

This project’s aims were to determine the extent of past restoration; substantiate the date stated by the donor, assuring the appropriateness of the exhibition label; remove surface dirt; and demonstrate surface dirt removal for CIGNA/NMAH staff. Findings during the work included the facts that the tacking edges were nonexistent or cut off, and the painting was glue-mounted to a Masonite board in the previous restoration. The edges were possibly trimmed off during the last restoration, or the painting never had a tacking edge or was never put on stretchers because it was a section of a much larger composition. No stretcher cracks can be found at the four corners, which leads to the speculation that the painting was not stretched at its current dimensions, or that the painting was cut down and the four corners were lost accordingly, or that the painting was never on a stretcher and it was created as a banner or painted cloth.
It was concluded that the appearance, condition, and style of the painting support the exhibition label circa 1850s. The current restoration has been around for at least 50-60 years. The painting is structurally stable. However, there are questions as to the extent and location of alterations, additions, or retouching. Nondestructive analysis with IR digital imaging and pigment analysis will be useful tools in the next step of investigation. Since the painting is lined on Masonite, X-ray analysis will not be helpful.
Coeur de Lion was an outstanding example of the golden age of the American clipper ship. She was a medium clipper, measuring 198 feet in length and 1098 tons. Built at Portsmouth, NH, for a local captain and a Bostonian, the figured head portrayed British King Richard the Lionhearted. The ship was launched Jan. 3, 1854, and was lost in a collision in the Baltic Sea in 1915. The clipper ship Coeur de Lion was painted in oil on canvas during her maiden voyage in 1854 by a Chinese artist Chong Qua, and this classic portrait is Chong Qua’s only known example of the genre. The ship is depicted entering the Hong Kong seaport with house, signal, and American flags flying from all three masts and the spanker gaff, in a standard classic ship portrait pose.

The painting is glue-lined on a heavier-weight canvas and the stretcher is not original. The natural resin varnish has yellowed over time and has shifted the tonal quality of the entire painting. The oil-based retouching has darkened significantly, and it is noticeable even to the casual observer. This disfiguring and blotchy retouching covers almost 40% of the sky. Currently, the painting is not exhibitable. Technical study including FTIR analysis of the medium of retouching was carried out and a special safe cleaning technique has been developed to remove the stubborn oil retouching.
MCI 6033: Painting Conservation of *Cable Ship Great Eastern*
MCI Project Staff: Jia-sun Tsang

This painting suffered water damage from a leak in the storage space. The varnish blanched and turned white. The most noticeable damage is located at the lower proper left part of the painting.

Ultraviolet examination revealed that the painting’s damage was extensive. The methods and materials used for the inpainting indicted that the restoration was modern, as was the blanched varnish. Isopropyl alcohol proved to be the most effective reform solvent to reduce the blanching. Consolidation of small paint flakes at the proper left edge of the painting was carried out using 10% B72. The painting was placed back in the frame and returned to storage.

Before        After

Details, water marks shown under UV light
(J-S. Tsang)
MCI 6034: On-site Examination of Five Paintings that were Tipped Over During Shipping from Philadelphia to NMAH, Washington, DC
MCI Project Staff: Jia-sun Tsang

The paintings, dated 1820-1860, are from the CIGNA collection, an outstanding collection of firefighting and maritime subjects containing art and historical objects dating back more than 250 years. To mark the acquisition of this gift from CIGNA, NMAH set up a special behind-the-scenes display entitled “Fire and Water” to showcase the collection.

Tasks were: (1) to evaluate the condition of the paintings; (2) to make recommendations for care and handling; and (3) to consolidate the flaking paint, if necessary. Instructions on preventive conservation were given to CIGNA museum specialists. Under UV examination, it became clear that painting #B30, an oil painting on wood, was heavily retouched, especially along an old split. It was determined that the wooden cradles put on during the last restoration should not be adjusted, because improper adjustment would create deformation of the painting and widening of the existing cracks.

Painting #B37

Old split in the wooden panel
Retouching along the old split; in UV light

Wooden cradle mounted on the reverse of the panel painting
(J.-S. Tsang)
Twenty-six samples were taken from a gunboat at American History by MCI staff for analysis. Several samples looked textile-related and were assigned to the textile conservator. Sample #26, “caulking,” had a fibrous appearance but was characterized with FTIR as containing cellulose and lignin—as wood would have. Scanning electron microscopy produced peculiar images of the material.

These images do not correspond to the interior or external surfaces of fabric fibers. However, hard fibers—not suitable for clothing or furnishings—were well-known in the 18th century for their use as ropes. In the sea literature, caulking the joins of boards was done with worn-out rope fragments and tar. With optical microscopy, correspondence to coconut palm fiber could be found. This fiber is a natural insulation layer between the edible coconut and the outer shell.
This rope fiber is commonly called coir, from the palm *Cocus nucifera*. The fibrous mesocarp is retted—left to separate in shallow pools—so that the final product to be spun into ropes contains mainly cellulose and lignin. Tannins and pectins disappear.

A cross section of the *Cocus nucifera* coconut
MCI 6051: National Museum of American History Renovation
MCI Project Staff: Marion Mecklenburg

The renovation of the NM AH presented questions regarding vibrations and the effects on the building and on artifacts stored in the building during renovation. Specifically, how far will jackhammer vibrations travel, and at what point should we consider the vibrations negligible? This study is ongoing.
During its renovation, the National Museum of American History will be rehousing 9,000 military uniforms using archival materials. Before ordering the yardage of necessary fabric, Preservation Services asked MCI to review various samples. We have tested for size (stiffener) that might be attractive to insects, unnecessary optical brighteners, and surfactant residues that are acidic in the long term.

Streaks of dark purple/blue constitute a positive reaction to starch or poly (vinyl alcohol) – in unwashed and washed samples. Optical brighteners used in commercial detergents fluoresce—absorb long-range ultraviolet light and emit blue-white light, rendering the textile whiter and less yellow. They are unnecessary for storage cloths.

During this testing, some old protocols were reviewed: Washing as a pretreatment did not remove all starch residue. Instead, preparatory washing inadvertently introduced optical brighteners because commercial detergents were used! Traditionally, unbleached cotton muslin was used for wrapping textiles in storage, but for storing wool uniforms the objectives are slightly different. A bleached white cotton will provide a much cleaner, clearer indication of any pest infestation than will a speckled surface; minor acidic surfactant residues are less relevant when the wool itself will be quietly outgassing sulfur, which in turn will be trapped by the storage cloth. In other words, the “best answer” may be the best answer for a particular project, but not necessarily for all textile storage at all times.
National Museum of the American Indian (NMAI)

MCI 5927: Coast Salish Blanket/Yarn
MCI Project Staff: Mary Ballard, Harry Alden, Tom Gluick, Charlie Tumosa

The Coast Salish of Washington state and British Columbia are renowned for their textile tradition. Central to this tradition were the thick white blankets that had a multitude of domestic uses. Oral tradition says that dog hair was used in making these blankets prior to European contact. Early explorers to the Northwest Coast, such as Captain George Vancouver, made reference to a white, long-haired Pomeranian-like dog whose fur supplemented other wool for textile production. The existence of the dog and the use of its hair in weaving are of interest to the Coast Salish and other Native communities as well as anthropologists, curators, and conservators. However, some scholars doubt the existence of this dog or that dog hair was ever used in these blankets. Fibers from Coast Salish blankets at the NMAI will be compared by microscopy and DNA analysis to fibers from pelts of dog, sheep, and goats collected in the 19th century from the Coast Salish region.
This work was part of a Mellon Fellowship research project, comprising Phase I of a larger project that seeks to determine the relationship between the quantity and type of salts found within archaeological ceramic sherds and their associated burial soil. Ultimately, the project aims to develop a field method for assessing potential salt efflorescence problems in excavated ceramics from the determination of salts in the soil. Advice was sought concerning the research project methodology, as well as assistance with the analysis of selected sherds, salts, and soil samples.

The purpose of the analysis was to identify soluble salts found in various ceramic sherd samples and their associated burial soils by X-ray diffraction (XRD), as a complement to other analyses conducted by the primary researcher at NMAI, including total dissolved salt determination from conductivity measurements, and several types of ion selective tests.

XRD examination of selected samples of soil and sherds – as whole pieces, powdered samples, and of the dried, wash water residues – showed the prevalence of calcite (calcium carbonate) and halite (sodium chloride) in most of the soil and sherd samples. A much larger array of salts were detected and identified in the filtered wash water residue from the soil and/or powdered sherds themselves. These salts represent potential efflorescence products and include: other carbonates that incorporate calcium, sodium, magnesium and/or potassium; potassium chloride; potassium sodium chloride; potassium nitrate; potassium hydroxide; calcium sulfate hydrate; and potassium sodium sulfate. Other possible sulfates and/or phosphates were difficult to identify with certainty. Concerning the relationship between soluble salts in the sherds and their associated soil samples, however, evidence for any correspondence beyond the presence of calcite is thus far inconsistent.

The presence of a gold paint or foil on the mask could not be definitely determined by radiography. It was hoped that a gold foil or paint would have appeared more opaque against a background of less dense mask pigments. It was found, however, that at 100 kV, the mask and the gold foil transmitted radiation at about the same rate. In any case, the existence of a thinly painted gold paint or foil could not be ruled out on the strength of radiographic evidence alone.
At the request of Native Americans, a minuscule yellow flap on a bone-and-leather hook used to catch halibut was examined. There are various restrictions on sampling Native American items, and in this case, a minimally invasive sample was permitted. However, the halibut hook could not be taken to the analyst's laboratory. The difficulty of cutting off a minimal portion of the flap was underestimated. Although it was very thin, it proved too tough to slice away a minimal sample with a scalpel blade gently enough to avoid losing it. Various means at hand of illuminating and magnifying the stubborn material were tried. The operation was not successful until fine scissors were resorted to as both scissor blades had to be searched to find the severed piece. The transparent sample was transferred to a diamond window, but success was in doubt until there was opportunity for confirmatory examination in the analyst's laboratory. Flattening the sample on the diamond window prepared it for infrared spectrophotometric analysis. Proteinaceous material and silica were present in the sample. Therefore, the minuscule yellow flap is more likely to be a remnant of bait than to be a damaged area of a varnish.
A small disfigured area in the bottom of a wooden feast bowl was pointed out. A diamond window was not available for collection of a sample from this area, so a glass vial for this purpose was made by cutting down a tiny test tube. After natural ester resin, presumably varnish, was found by infrared spectroscopy, some sample remained. This was submitted to gas chromatographic-mass spectroscopic analysis (GC-MS), which confirmed the presence of natural ester resin. More interestingly, naphthalene, an insect repellant, was also detected. Generally, one can count on only the major components in a sample contributing significantly to the sample's infrared spectrum. It was no surprise that GC-MS turned up another component.

On just the basis of the results from infrared spectroscopy, the disfigured area might be thought to be a "drip" of natural ester resin. But the more expansive GC-MS results point strongly toward there being an overall surface coating (varnish?), mainly natural ester resin, and indicate that some particles of naphthalene have dissolved and disfigured the area at the bottom center of the bowl. If another tiny sample from an area that is not disfigured could be taken, confirmation could be sought.
MCI 6003: Pacific Northwest Coast Cedar Canoe
MCI Project Staff: Don Williams

A mast was fabricated to match the needs and dimensions of an existing Northwest Coast canoe whose original mast was missing. New mast was fabricated using hand tools similar to those used to make the original, using wood (red cedar) native to the Pacific Northwest.

MCI 6011: Northwest Coast Potlatch Figure
MCI Project Staff: Mel Wachowiak

A Northwest Coast potlatch figure was submitted for advice regarding the reattachment of the figure’s arm in preparation for an upcoming exhibit. A treatment design was completed, including a barrier coat.
Fragmentary blue glass beads that had been damaged by glass bead disease were analyzed. The staff identified the deposit on the outside of the beads and the chemical make-up of the beads, particularly the amount of alkali (Na or P) added to the glass. The purpose of analysis was to determine the deterioration mechanism at work for these specific beads and to develop a possible conservation treatment to stop or slow the deterioration.
The Smithsonian’s National Museum of the American Indian has in its collection a fascinating group of 47 ceremonial masks and shields made of wood, which were covered with a decorative “skin” made up of tiny mosaic pieces of stone and other materials. They were found in the area around Puebla, in the Mixteca region of Mexico, and are considered to be pre-Hispanic (Aztec) creations. Many are fragmentary, with more or less of their decoration preserved, and they represent a range of styles and quality. These objects offer many interesting angles of research to pursue: archival sleuthing and oral history to retrace their path from discovery to the NMAI; iconographic, stylistic, and archaeological investigation to understand their meaning and use; and technical study to understand the materials and craft techniques used by the artisans.

One of the important technical questions concerns the blue-green stone components, often identified as turquoise. This material’s primary source would have been mines in modern-day New Mexico and Arizona, thus making it an expensive long-distance trade item and accessible only to elites. Were less precious materials of similar appearance used instead, when lavish use of turquoise would not have been possible, or where slight color differences were desirable?

As a preliminary step toward a more comprehensive study, carried out by staff from NMAI and MCI and spearheaded by outside scholar Dr. Sue Scott, we tested the use of X-ray fluorescence (XRF) analysis for the identification of the greenish tesserae. This instrument detects key elements (those lighter than titanium in the periodic table are not readable), which can provide important clues to composition. The technique’s advantages are that it is noninvasive – i.e., a sample does not have to be removed for testing – and uses a portable device that can be brought to the object.

From tests carried out on the shield #108708 and on some mineral reference specimens, XRF appears to be useful as a first analytical step. We were able to make an important separation based on copper, providing a way to distinguish green copper-bearing minerals such as turquoise (copper-aluminum phosphate), chrysocolla (copper silicate), and malachite (copper carbonate), which we found in a test of tesserae in the center — from green non-copper-bearing minerals such as amazonite (a potassium-aluminum silicate), or jadeite (sodium-aluminum-iron silicate) which we found on the border. Further distinctions based on other elements, such as potassium, zinc, and iron, may be possible.

A more nuanced use of the XRF data will be possible when they are combined with information obtained from detailed visual inspection, such as that made by a mineralogist. This will provide a critical framework for the analytical work, by defining the variety of stone types, selecting areas for XRF analysis, and identifying potential tesserae, which were loose or could be temporarily removed without harm, for analysis by techniques such as X-ray diffraction to confirm mineral identification.
A stone sculpture, Conquering Warrior, was submitted for X-ray analysis.
National Museum of Natural History (NMNH)

MCI 5814: Custom Manufactured Box with Lid to Store Photographs
MCI Project Staff: Walter Hopwood

It was determined, based on a test with metal coupons and A-D, strips that boxes used to store photographs were off-gassing. This work was done to find out the composition of the off-gassing products to protect the photograph collection.

MCI 5934: Rock Fragments with White Accretions
MCI Project Staff: Jia-sun Tsang, Ron Cunningham, Sarah Pinchin

The rock fragments were collected from a site containing stone mounds, kheretsur enclosures, and the largest concentration of deer stones, in the Hovsgol aimag Province of Mongolia. The rock fragments were submitted for analysis to identify the rock and to identify the composition of the white weathering crusts or accretions. This information will be useful in understanding the preservation issues of the deer stones, which are currently unprotected in the outdoor landscape of the Mongolian steppes.
MCI 5943: Wood Samples from Mongolia
MCI Project Staff: Harry Alden, Rae Beaubien

Three wood samples from Mongolia were sent to MCI for analysis, at the request of Drs. J. Daniel Rogers and William Honeychurch (Anthropology Department, National Museum of Natural History).

One of them, a large sample, was identified as coffin wood from a Xiongnu-period burial at Egiin Gol, in northern Mongolia (ca. 300 BC – AD 200). The wood is similar to that found in Xiongnu burials at Gol Mod 2 Cemetery (in Arkhangai aimag, northern Mongolia), seen in the photo.

The two other wood samples included an unidentified fragment and a portion of an arrow shaft.

Analysis carried out by Harry Alden identified the samples as follows: large sample: larch (Larix sp.); small sample: red pine group (Pinus sp.); arrow shaft: unconfirmed, although juneberry (Amelanchier) and rose stem (Rosa) were suggested.

MCI 5951: Oil on Canvas Oversized Painting
MCI Project Staff: Ron Cunningham

Advice was given on securing the painting for moving and storage.
The northern Mongolian province of Hovsgol aimag has been the focus of collaborative research coordinated by the Arctic Studies Center and its director, Dr. William W. Fitzhugh (Smithsonian's National Museum of Natural History) since 2001. In its investigations of the region's connections to Arctic cultural history, the Joint Mongolian-Smithsonian Deer Stone Project has included archaeological studies of "deer stones" and the ritual contexts in which they are found. Averaging 1-3 m in height, these upright stone slabs are characterized by low-relief carvings of deer with flowing antlers. Over 550 have been identified thus far in Mongolia's grassy steppe region; they occur singly, in small groups, or concentrated in larger groupings, often in association with stone burial mounds, called khirigsuur. These monumental features have generally been dated to the Late Bronze to Early Iron Age, approximately 3000 years ago.

Geographic isolation has hampered systematic documentation and archaeological investigation, and very little is known about the deer stones' age, function, and meaning within their social context. Endangered by exposure to harsh environmental conditions and increasingly by human causes, the deer stones are now considered among the most important - and threatened - archaeological treasures of Central Asia. This has placed a high priority on efforts to understand and preserve these national icons, and has framed the documentation component being undertaken by MCI.

Documenting the deer stones includes photography of all sides with color and scale indication, drawings, condition notes, and, for the first time, three-dimensional records of individual monuments. All of these efforts are intended to complement the detailed mapping and archaeological data from deer stone site investigations.

A priority of the conservation team has been testing a portable hand-held 3-D laser scanner for use in the field. This technology allows dimensional and topographic information to be recorded rapidly and accurately in digital format without directly contacting the object's surface. The digital files can be displayed graphically and can also be exported to specialized milling machines to create high-resolution 3-D models.
Once the logistical aspects of scanning under extremely rustic conditions were worked out, Rae Beaubien, Vicky Karas, and Carolyn Thome were able to scan 10 deer stones at four sites, using locally available materials to construct temporary shade shelters over the deer stones and a small generator to run the scanner and a laptop computer. Three of the sites were located around Lake Erkhel, about 30 km north of Muren, the region's major town: Ulaan Tolgoi on the west side, with five deer stones, including the tallest one known to date (3.8 m); and Erkhel North and Erkhel East, with two deer stones each. The team ultimately required only 2 to 3 hours to completely scan a deer stone, including the time to set up the shelter and equipment. The post-processing steps necessary to prepare the data files for graphic modeling and reproduction are currently being carried out at MCI.
Deer Stone #5 at the Ulaan Tolgoi site (H. Beaubien)
Scan data for Ulaan Tolgoi deer stone #5, displayed on a computer screen (B. Karas)
MCI 5996: Analysis of Disfiguring Deposit on a Breech Cloth
MCI Project Staff: Walter Hopwood

The senior objects conservator removed, under the microscope, agglomerations of a colorless material disfiguring a loosely woven colorful breechcloth from the Philippines. This textile was to be put on exhibit. An infrared spectrum of a minuscule sample of the disfiguring material characterized it as a wax. Under the microscope, it was found to melt over a low, wide range of temperature.

Therefore, there is a wide selection of solvents suitable for removing the traces that could not be pulled away from the breechcloth without taking with them many of the fine threads of which it is made. Warm organic solvent efficiently removed the disfiguring wax, and threads stayed in place.
MCI 5999: Khanuy Valley Project on Early Nomadic Pastoralism in Arkhangai Aimag, Mongolia
On-site conservation assistance and training, 2005 field season
MCI Project Staff: Rae Beaubien, Vicky Karas

The Khanuy Valley, located in Mongolia’s north-central province of Arkhangai aimag just south of Hovsgol, is being investigated by a team under the direction of Dr. Francis Allard (Indiana University of Pennsylvania). Since 2001, the field work has included surface and subsurface surveys, paleoenvironmental work, an ethnographic study, and excavations of Bronze Age khirigsuur sites, as well as an important Xiongnu-period cemetery at Gol Mod 2. The Xiongnu were Central Asian nomadic people who dominated portions of China and Mongolia between the 3rd century BC and 2nd century AD. An arc of small satellite tombs, associated with a large royal burial, have yielded wood and gilded iron coffin components, iron and bronze objects, some with associated textile fragments, and horse burials, as well as human remains. These finds prompted a project request for assistance from MCI conservators during the 2005 Mongolia field-work.

Rae Beaubien and Vicky Karas joined the Khanuy Valley Project to assist with the field recovery and stabilization of several fragile materials. These were packed for transport, along with other excavated finds, for storage and subsequent study at the Institute of History in Ulaanbaatar.
Artifacts from archaeological sites in Alaska and Canada were selected at the National Museum of Natural History and residues were analyzed to determine their lipid and protein composition. Residues were found in cooking vessels, either absorbed in the clay matrix of ceramics or trapped as a charred layer adhering on the surface of pots. Seals, whales, and walrus were the principal source of food, as well as oil for the lamps. In the arctic treeless regions, blubber-burning lamps were essential household utensils in daily life: They were used for heating, lighting, drying, and cooking. By analyzing cooking residues in the arctic archaeological context, we can characterize, identify, and understand the degradation of organic compounds resulting from the processing of foodstuffs and correlate this information with the anthropological context.

Organic residues were analyzed together with modern reference samples of whales and seals. The fresh specimens were also thermally degraded to simulate cooking and aging. Extraction of the lipids was followed by derivation and analysis by gas chromatography and mass spectrometry. Methods to analyze proteins on archaeological artifacts have in the past given few reliable results, especially because proteins are denatured and modified when they are processed. An original methodology developed in this study and derived from new developments in proteomics offers promise in identifying species-specific proteins. Proteins are extracted, denatured and digested by an enzyme, and their peptide fingerprint and sequencing are characterized by techniques of mass spectrometry (MALDI-TOF and Electrospray-MS).
This project consists of a technical study and conservation of two unusual bronze objects excavated in 2005 from a burial in the Xiongnu-period cemetery Gol-Mod 2 (Arkhangai aimag, Mongolia) by the Khanuy Valley Project on Early Nomadic Pastoralism in Mongolia. The artifacts, in the form of a large disk and a small perforated hemisphere, included wrappings of fragile but well-preserved cloth and cordage remains. Following preliminary stabilization by conservators in the field, they were brought to MCI for further conservation and technical investigation, to assist in their identification as well as their long-term preservation.

The artifacts were analyzed using noninvasive techniques, including optical microscopy, X-ray fluorescence spectroscopy, x-radiography, and computer tomography, and techniques utilizing extremely small samples, including X-ray diffraction, Fourier-transform infrared spectroscopy, and scanning electron microscopy with energy dispersive X-ray spectroscopy. Among the evidence obtained to date are indications that the objects are from copper-tin (bronze) alloys containing lead and arsenic. The textiles are plain weave fabrics made of animal hair fibers, possibly cashmere.

The information obtained from these analyses and from comparative research in the published literature so far has helped to elucidate the possible origin of the artifacts as well as their function. Striking parallels with both Sarmatian mirrors and Sarmatian horse breastplates (*Phalerae*) have been found, while stylistic and technological connections to materials of Chinese origin were not apparent. As demonstrated by such artifacts, a link between the Xiongnu and more western nomads of Central Asia could have important implications in understanding the relationships among the Eurasian steppes peoples. Additionally, the results of this study provide further insight into Xiongnu material culture both for bronze artifacts and textile production.
The Rosebud Winter Count is a pictographic history, one of approximately 200 known Lakota Sioux winter counts, most of which are variations of some one-dozen different historical traditions. The Rosebud Winter Count consists of 135 pictographs drawn in ink, pencil, and perhaps crayon on a piece of muslin measuring 89 by 176 cm.

The technical study of the Rosebud Winter Count consists of the nondestructive examination of the fabric support, the pencil media, and the colored media, as well as the technique of application of all colored media. In this ongoing project, the following steps are planned: The textile support will be documented, examined, and analyzed, and then the pictographs will be examined and documented. Dry media elements will be examined by the unaided eye and also microscopically in order to characterize campaigns, and to determine whether pencil or crayon was used. Possible and presumed wet media will also be examined—to characterize campaigns and method(s) of application, such as, brush, pen, or stylus, and to examine whether the application is uniform or non-uniform. Colorants and perhaps dry media will be examined nondestructively using X-ray fluorescence and Raman. Finally, material sources will be researched to determine whether trading dates can be identified, and whether earliest available dates can be identified for materials.
MCI 6023: Tlingit Indian Robe and Knife
MCI Project Staff: Aaron Shugar, Lynn Brostoff, Rae Beaubien

Several Tlingit objects were analyzed in situ using portable XRF equipment. The purpose of the analysis was to compare MCI’s Innov-x and NMNH’s Niton portable XRF instruments and results by documentation of materials, manufacture, condition, etc., as part of a response to requests for repatriation.
The de-installation of a gallery at the National Museum of Natural History provided the conservators of the Anthropology Conservation Laboratory with the opportunity to review the condition of garments collected—and even commissioned—by an NMNH curator in 1961. Various types of soiling were noted and the conservators sought advice about the various cleaning options, including those that might have been used in the local village where the clothes were purchased and those that might be successful in removing mouse urine and excrement.

In this project, solutions of anionic and nonionic surfactants were given to ACL to test: 0.2% saponin (a vegetable, anionic carboxylate soap), 0.2% sodium dodecyl sulfate buffered to a pH of 7, and 0.019% octyl phenyl ethoxylate nonionic surfactant. The saponin is the least likely to bleed cheap bright direct dyes, which are often not wash-fast. It is also widely available in many forms across cultures and climates. The SDS is a standard cleaning agent, the basis of most shampoos. The OPE represents a large fraction of the active ingredient in dishwashing liquids. At the same time a reference to local Pakistani cleaning practices was sought.

It was found that none of the surfactants cleaned more effectively than water did alone, so the ACL conservators were comfortable with their decision to clean only with water. Concerning references to Pakistani laundry practices in the 1960s, only one could be found (in Eglar, Z., *A Punjabi Village in Pakistan*, New York, Columbia University Press, 1960, p.61): “As the sun rises higher and if the well is working, some women go there with their laundry, which they have soaked in boiling water and washing soda, and, placing a washboard under the running water, they beat the clothes with a wooden club, rub them with soap, and rinse them out. They spread the clothes to dry on the grass in the fields next to the well. The dry clothes are not ironed.”
The severity of this treatment—boiling, alkaline treatment (saponification), and soap—suggests that it was used for everyday clothes rather than the mirror-decorated and embroidered finery in the diorama. The more careful ACL treatment did provide satisfactory results.

MCI 6027: Phytoliths and Starch Grains in Ancient Stone Tools
MCI Project Staff: Mel Wachowiak

The Archaeobiology Laboratory requested the loan of a microscope to look at phytoliths and starch grains on ancient stone tools. A microscope was loaned to Archaeobiology and set up in their laboratory.

MCI’s Leitz Pol 12 polarizing light microscope was cleaned, aligned, and delivered. Training was given in use of the microscope for starch-grain examination. A C-mount camera 1xx“O” tube was also loaned and fitted to Archaeobiology’s Polaroid digital camera. Guidance was offered for software setup and calibration of the camera system, and a new 100-W halogen lamp was installed and aligned.
MCI 6042: Hawaiian Tapa  
MCI Project Staff: Mary Ballard, Walter Hopwood

A large Hawaiian tapa (bark cloth) has a dark and brittle damaged area. No staining material was discovered with infrared spectroscopy. Water-soluble plant material was found in both the damaged area and in an untroubled area on another edge of the tapa. Infrared spectra from the two areas were somewhat different. The differences were telling and suggested that chemical change in a largely-carbohydrate nonfibrous plant material of the tapa produced the effects seen in the troubled area. The material isolated from the troubled area was stiffer than similar material from the untroubled area. Exposure to strong reagents such as acids is suspected, as is damage to the fibers of the tapa, which were not sampled. Cosmetic blotting away of a portion of the dark material with water left the troubled area with its original brittleness. Not all of the dark material was blotted away, in order to achieve a compromise, more homogeneous appearance.
The focus of a documentation project undertaken by MCI conservators for the past two years are carved stone monuments called deer stones, produced about 3000 years ago. More than 500 of these monuments are distributed across Mongolia’s vast steppe, and they are considered to be among the most important archaeological treasures of Central Asia. Yet very little is understood about their age, function, and meaning within the culture that produced them. This is due in part to their geographic isolation, which has hampered systematic documentation and archaeological investigation. Additionally endangered by unprotected exposure to harsh environmental conditions and increasingly by human acts, these monuments were considered ideal candidates for a program of documentation that included 3-D scanning technology. This technology provides an accurate and rapid non-contact means of capturing detailed topographic and dimensional information in digital format. The scanning products, along with photographs, descriptive information, and condition notes, form an important record that has applications for research, museum display, and preservation.

Based on a successful pilot test in 2005, a team of MCI conservators carried out the 2006 scanning project during the field season of the Joint Mongolian-Smithsonian Deer Stone Project, directed by William W. Fitzhugh, head of the National Museum of Natural History’s Arctic Studies Center. The MCI team was assisted by Mongolian archaeologist Songuulkhuu Namjil and, above all, by our driver Narangil.

A Breuckmann TriTos structured-light scanner was used to produce complete high-resolution 3-D digital records of the 14 deer stones (including #14, which had been molded and cast by Smithsonian model-makers in 2002) at Ushkiin Uver. A view of that deer stone, the night-time scanning process, and a detail of the resulting scan are pictured. Also scanned this year was Ulaan Tolgoi deer stone #2, the tallest known at nearly 4 meters, which had been difficult to scan in 2005, near Lake Erkhel. (Both sites are in Hovsgol aimag). Other deer stone documentation activities were carried out at the Hovsgol Museum in Muren, as well as at the sites of Burdii Ekh, Khushuutii am, and Khanuy Valley KYR119 (Arkhangai aimag). The high-resolution data files are currently being processed at MCI.
MCI 6048: Field Conservation for the Joint Mongolian-SI Deer Stone Project 2006 Field Season
MCI Project Staff: Rae Beaubien, Vicky Karas, Leslie Weber

Archaeological conservation activities typically take place during the excavation and study phases of an archaeological project, and include involvement in the field recovery of artifacts; basic stabilization of excavated finds—e.g., cleaning, consolidation, and reassembly; housing for safe transport and storage; and other preparations that allow these important materials to be studied and enjoyed in the future.

MCI conservators participated in the 2006 archaeological field season of the Joint Mongolian-Smithsonian Deer Stone Project (DSP) in Mongolia, which is directed by William W. Fitzhugh, head of the National Museum of Natural History’s Arctic Studies Center. While a major focus was the field documentation of ancient deer stones using 3-D scanning technology, conservation of artifacts was also a part of the season’s activities, especially during a short period of residency in the capital city, Ulaanbaatar.

For the third year, the DSP organized a professional symposium for presentation of current archaeological and ethnographic research in Mongolia, accompanied by practical workshops on various conservation topics. These have provided an active forum for bringing together the conservation and museum community in Mongolia. This year, we were able to spend some time with staff at the Cultural Heritage Center, the hub of the conservation community in Ulaanbaatar. The CHC is charged with registering the historical and cultural monuments of Mongolia, which includes a program of molding and replicating key sculptures, as well as restoration; current projects include cleaning and mounting leather garment and other costume elements, and stabilization of flaking paint on polychrome sculpture.

Conservation of newly excavated materials is of growing interest in the Mongolian archaeological community, not just among DSP colleagues based at the National Museum of Mongolian History but also within the Institutes of Archaeology and of History (components of the Mongolian Academy of Sciences).

The Khanuy Valley Project on Early Nomadic Pastoralism, collaborating with the DSP this year, is one project that has begun to incorporate conservation in both field and lab operations. In July, we continued our work with this team in their lab space at the Institute of History, focusing on artifacts recovered from Gol Mod 2, an important Xiongnu-period cemetery dating between approximately 300 BC and 200 AD. Our focus was a large artifact—a segment of a wooden coffin wall decorated with iron strapwork—which MCI conservators had block-lifted during the 2005 field season. Although the wood was badly degraded, the iron pieces had been maintained in their original positions by the plaster jacket. We were able to excavate and reassemble them (seen in photo), and fabricate a protective storage box that would allow the pieces and their arrangement to be accessible for further study. In addition, a protective storage housing was made for an unusual bronze disk wrapped in textile, two of which have been excavated from burials at Gol Mod 2. The other disk is currently being analyzed and conserved at MCI, on loan from the.
Mongolian Academy of Sciences. This season, the Khanuy Valley team and the French-Mongolian team excavating Gol Mod (1), another Xiongnu cemetery, had an opportunity to interact closely for the first time. The team, which included a conservator, was carrying out lab work at the Institute of Archaeology nearby, allowing a fruitful exchange of ideas about the artifacts, and paving the way for future archaeology-conservation collaborations in Mongolia.
Black elements in the design of several Fijian tapas (bark cloths) tended to flake off. Infrared spectroscopy performed on yellow semi fluid, white fibers, and black fibers under the flaking black pigment showed the presence of deteriorated cellulose (semi fluid) and of deteriorating cellulose (fibers). No paint medium was found associated with the pigment. Indeed none is expected because, by convention, powdered pigment is pounded into the fibers of bark cloth. This physical stress predisposes the cellulose fibers to chemical deterioration. Elemental analysis of the pigment suggested the presence of elemental carbon and of an iron pigment. Powdered charcoal (carbon) is traditionally used. The iron pigment was identified as magnetite (black iron oxide) when some of the black particles were found to be attracted to mild steel.

The flakiness of the black design elements is accounted for by discovery of deterioration of the underlying cellulose (bark cloth). The deterioration itself is attributable to metal-catalyzed oxidation likely in the presence of finely divided magnetite. Heating of the black design elements from exposure to sunlight may also have contributed to cellulose deterioration. The presence of inorganic chloride was discovered by infrared spectroscopy of an ammoniated extract of a tapa sample. (Ammonium chloride was produced.) This suggests exposure to sea water or salt spray from the ocean. Finally, agitation of tapas that were used as garments would contribute to flaking of any loose constituents.
MCI 6062: Documentation of Pre-historic Archaeological Textiles
MCI Project Staff: Mary Ballard, Mel Wachowiak

Approximately 20 digital photographs of pre-mounted fibers and textiles were taken through a stereo microscope and a high-powered optical microscope owned by MCI with the aid of MCI staff Mary Ballard and Mel Wachowiak. The documentation was for fiber content and weave structure for archaeological textiles subject to repatriation.
National Portrait Gallery (NPG)

MCI 5952: Bust of Nathaniel Bowditch
MCI Project Staff: Carol Grissom, Nicole Grabow

The object was an off-white painted bust, likely made from plaster, of Nathaniel Bowditch, an accomplished scientist, mathematician, and navigator. Overall, the object was in good condition, although quite dirty. There were several issues pertaining to the condition of the surface: the presence of a dark orange material in several crevices, several layers of old paint, a thick layer of gray grime, localized dark spatter marks, and very dark greasy fingerprints. The object was examined under ultraviolet radiation and samples were taken for FTIR and GC-MS analysis. The sculpture was cleaned successfully.
MCI 5953: Bust of Benjamin Franklin Butler
MCI Project Staff: Nichole Grabow

The sculpture was a carved marble bust of Benjamin Franklin Butler, an American politician and a Union general during the Civil War. Overall the condition before treatment was good, with some localized soiling. The most significant example was a dark, child-sized, dirty handprint on the back of one shoulder. The sculpture was cleaned and microcrystalline was selectively applied.
The sculpture, which was probably made from painted plaster, depicts three men in the round. The central figure is a seated President Abraham Lincoln holding a document. Behind him are Secretary of War Edwin Stanton and General Grant. The overall condition before treatment was good, though the paint layer is thick and there was some flaking. Cleaning of the sculpture and consolidation of some of the paint was successfully completed.
The object was a marble bust of William Henry Seward. Overall the condition before treatment was good. The marble was somewhat grimy, particularly toward the bottom edge where it may have been frequently handled. The socle was in poor condition with failing plaster repairs. The bust was cleaned and losses to the socle were refilled.
MCI 5956: Low Relief Bust of General George McClellan
MCI Project Staff: Carol Grissom, Nichole Grabow

The object was a painted wooden plaque with a relief-carved portrait of George Brinton McClellan, most famous as a major general in the regular army during the Civil War. The overall condition before treatment was good to fair. There were numerous open joins, several loose pieces, stains, and losses. The object was cleaned, wood fragments reattached, holes refilled, losses sealed, and stains made less visually distracting. X-radiography of the object was completed, and several cross sections of the paint layers were taken and cast in epoxy for future study.

Before treatment

After treatment
MCI 5957: A Statuette after Clark Mills’s *Andrew Jackson on Horseback* (ca. 1860) Made by Cornelius & Baker
MCI Project Staff: Carol Grissom

Treatment of this early American cast-zinc statuette consisted principally of partial removal of black overpaint on the figure’s proper right arm and the horse’s rump, inpainting, waxing, and the design and installation of a new mounting system. Prior to treatment, the statuette was examined in some detail in comparison to a similar statuette owned by the Smithsonian American Art Museum (No. 1983.101.5). This revealed that apart from differences in the bases, the two statues were made using the same molds, since the same mold-based flaws appear on both copies. Moreover, comparison showed many small differences in assembly and finishing. This copy, for example, has delineated seams on Jackson’s pant legs and jacket sleeves, which the other copy lacks. The statuette was also X-rayed, which revealed original metal armatures in the horse’s legs and metal rods used to attach the horse’s legs, as well as a modern metal bolt used to repair the horse’s tail. While the SAAM copy appears to have only its original “bronze” paint, this copy has been repainted a number of times with “bronze” paint, and a sticky coating seems to have been applied more recently. A sample of this coating was analyzed by Fourier transform infrared spectroscopy.
Motivated by the possibility of getting a commission for a life-size bronze equestrian portrait of Washington, and having received a commission for a standing marble figure from the state of Virginia, the most renowned French portraitist of his era traveled to Philadelphia with three assistants and Benjamin Franklin, arriving on Sept. 14, 1785. Then, during a two-week visit to Mount Vernon, Houdon took measurements of the first president, made the life mask now at the Morgan Library, modeled the low-fired clay bust of Washington à l’antique without any drapery that is in the collection at Mount Vernon, and made plaster molds of the clay bust. After his return to Paris, Houdon displayed a plaster bust similar to the Mount Vernon bust in his studio at the end of 1786, and reported it finished in January 1787. He then incorporated the head in a bust described as à l’antique with drapery. This is the version at the National Portrait Gallery, and the museum’s copy bears a wax cachet de l’atelier that indicates it was made in Houdon’s studio during his lifetime.

The purpose of treatment was to prepare the bust for exhibition in the reopened Patent Office Building. During examination it became clear that the statue had been badly broken (the head was severed) and was not very well repaired. X-radiography showed that a metal rod had been installed at the center of the bust, linking the socle to the figure’s shoulders. This was almost certainly done at the time of repair, and its discovery explains a rectangular cut-out in the back of the bust. In addition, the uncoated surface of the bust was badly eroded, probably by harsh cleaning to remove paint, and it was covered with stubborn dirt. Treatment included cleaning, improvement of fills, and inpainting. Comparison to another copy of the same series in the collection of the National Gallery (No. 1991.199.1) was helpful in correcting the modeling of an area of loss in the left forehead. Since the surface of the National Gallery’s copy is less eroded, it also confirmed the fabrication evidence of piece mold joins found on the National Portrait Gallery’s copy.
Bust of George Washington before and after treatment
The sculpture is a carved marble bust of Samuel Gompers, the first president of the American Federation of Labor. Gompers is depicted wearing a jacket and tie. The bust is truncated before the shoulders, and the subject looks directly ahead. The condition of the object was good, although there was significant surface soiling on the nose and several other high points of the face. Areas of significant soiling were tested with various cleaning methods. Overall, the cleaning was very effective.
MCI 5983: Bust of William Cullen Bryant
MCI Project Staff: Carol Grissom, Nichole Grabow

The object is a marble bust of William Cullen Bryant, a well-known poet and literary figure. Overall, the object was in good condition although the surface was quite dirty, mostly on the areas most handled. Areas of significant soiling were tested with various cleaning methods. Overall, the cleaning was very effective. Old inpainting and fills were tested with various solvents, removed, and refilled and inpainted. An iron stain was reduced also. In order to protect the sculpture while on display, a layer of Renaissance Microcrystalline Wax was applied and buffed lightly after it was dry.
MCI 6017: On-site Conservation of Painted Frame of *Indian Lady, Daughter of a Cacique*

In the exhibit *Retratos: 2,000 Years of Latin American Portraits*

Stabilization of frame so the painting can be shipped safely to the next venue

MCI Project Staff: Jia-sun Tsang

The oil-on-canvas painting dated 1757 is a rare portrait of a 16-year-old mestizo done just before she entered the convent of Corpus Christi, founded in Mexico in 1724. The painting is located in the first gallery of the exhibit. With more than one hundred painted and sculpted portraits from 76 leading museums and private collections in Mexico, Central and South America, the Caribbean, and the United States, this exhibition is the first to consider the rich traditions of portraiture in Latin America from a multinational point of view.

The painting was taken off the exhibition wall during de-installation of the exhibit and was placed on a padded table. Five- or 10-percent rabbit skin glue solutions were prepared at MCI and warmed up on-site with an electric cup warmer. The glue was applied with a watercolor brush along the crack and into the crevice of the polychrome frame. The frame was left to dry on the padded table for 24 hours.

Full view
(J-S. Tsang, from exhibit catalog)

In-situ conservation
(J-S. Tsang)
Office of Facilities Engineering and Operations (OFEO)

MCI 5833: Patent Office Building (NPG/SAAM)
Review renovation and structural repairs
MCI Project Staff: Marion Mecklenburg

A proposal prepared by Robison-Prezioso, Inc., titled “Physical Plant Renewal, Old Patent Office Building,” was reviewed. The proposal recommends an air-abrasive removal of all existing layers of paint, reattachment of loose plaster with an epoxy adhesive, and a refinishing of the walls with a scratch coat and finish coat of plaster. Another component addresses the reinforcement of the top of the vaulted arches where material has been removed for conduits. In general, the proposal is sound and some further considerations were put forth.
MCI 5925: Particulate Materials Exhausting from Pod #3 at MSC
MCI Project Staff: Marion Mecklenburg, Walter Hopwood

MCI was requested to help determine the cause of a black precipitate accumulating on the roof of the Museum Support Center (MSC). The precipitate was accumulating in the vicinity of the exhaust vent and fan houses over Pod 3, which currently houses the liquid-stored collections for the National Museum of Natural History. Samples of the black residue found on the exhaust vent, the north fan house, and the pre-filters from the roof of Pod 3 were analyzed. The residue on the roof is a combination of degradation materials, but one significant result of the analysis is the finding of carbohydrates and gums. These are degradation byproducts of the hydrolysis of cellulose. In other words, there is acid reacting with cellulose. The most likely source of degraded materials is the tanks and filters in Pod 3.

MCI 6031: Coolant Sample from NASM
MCI Project Staff: Marion Mecklenburg, Walter Hopwood

An unknown sample was submitted for identification and chemical comparison by FTIR to determine whether the unknown compound is ethylene glycol or propylene glycol. An infrared spectrum of the clear liquid coolant, not including yellow precipitate, showed the presence of ethylene glycol.
MCI 6058: Four Seasons Bench
MCI Project Staff: Carol Grissom

The Smithsonian Division of Horticulture’s Four Seasons Bench (1976.003.004) was examined during treatment at Architectural Iron Works in Milford, PA, where it was under contract to T. Scott Kreilich (Kreilich Conservation of Oreland, PA). One foot on the aluminum bench had been broken off and was rewelded by the foundry. Workers also added shims to make the bench sit properly, and the bench was about to be repainted at the time of the visit. The contractor’s work was thought to be competent, if expensive.
Office of the Under Secretary for Science (OUSS)

MCI 6009: Smithsonian Institution Building "SI Castle"
MCI Project Staff: Marion Mecklenburg

A proposal was submitted to determine the source of dampness and mold that is found throughout the Smithsonian Castle. Possible source of the moisture was determined. There was no recurrence of the mold problem at the SI Castle in the summer of 2006.
William Rimmer’s *Falling Gladiator* is a seminal work by an important self-trained American sculptor. Working in an unheated basement in Massachusetts, the sculptor modeled the statue in clay without using an armature. When it began to fail, the partially completed statue was cast in plaster. Rimmer then completed this plaster model, and it is this statue that, following a peripatetic life, was given to the Smithsonian by the sculptor’s daughter in 1915. Originally in the National Collection of Fine Arts, the statue was displayed for many years at the Museum of National History, where it was badly damaged by a falling ladder and repaired in the 1940s.

The statue was sent to MCI for two reasons: (1) to prepare it for reinstallation at the Patent Office Building when SAAM reopened and (2) to determine how the sculpture was constructed, if it was a professional or amateur casting, if changes were made since it was originally cast, and if it is fragile or unstable. Preparation of the statue for reinstallation included complete removal of paint layers that had been applied over the years, adjustment of many plaster fills that frequently covered original plaster, and application of a new surface coating. X-radiography was performed to reveal damage and determine the location of metal armatures. Thick armatures were found inside the stump and connecting it to the figure. Thinner rods were revealed spanning seams in the right upper arm, left wrist, right heel, lower left leg, and hips.

The project has answered all of curator George Gurney’s questions. It has become clear that the original casting was professionally done. Based on 1882 photographs it is clear that the statue was cut into more than 10 pieces soon after it was made, possibly as early as 1864 when a plaster copy was made for exhibition in Europe. Metal armatures were added afterwards. Despite minor surface damage and losses from the cutting apart and subsequent breakage, the statue reads substantially as the sculptor intended, and it does not appear to be fragile or unstable.
MCI 5901: *The Puritan* by Augustus Saint-Gaudens
MCI Project Staff: Carol Grissom, Jia-sun Tsang, Sarah Pinchin

This cast bronze statue’s surface finish was investigated to determine, among other things, if gilding was present. The information from the investigation will be used to improve the surface appearance of the statue, possibly by repatination.
MCI 5964: A Statuette after Clark Mills’s *Andrew Jackson on Horseback* (latter half of the 19th century)
MCI Project Staff: Carol Grissom

Treatment of this early American cast-zinc statuette consisted of repairing the broken proper right arm so that the statuette could be displayed in the Luce Center when the museum reopened in the Patent Office Building. In preparation for treatment, the statuette was examined in some detail in comparison to a similar statuette owned by the National Portrait Gallery (No. 85.8). The SAAM copy’s “bronze” paint appears to be original and in relatively good condition. While it has a smaller base than NPG’s copy and lacks an inscription for Cornelius & Baker, close examination revealed that it was made using the same molds since the same mold-based flaws appear on both copies. Comparison of the two copies also revealed many small differences in assembly and finishing. This copy, for example, lacks delineated seams on Jackson’s pant legs and jacket sleeves, which the other copy has. The statuette was also X-rayed, showing metal armatures in the horse’s legs and metal rods used to attach the horse’s tail and legs.
The center medallion American appliqué quilt needed conservation help on minor stitching to prepare for re-opening of an exhibition. The quilt was unrolled and examined. It was decided to turn each excess margin back and introduce three separate seams to hold the cloth margin in place against the dust cover. Each seam had a function: the first to flatten the fold of the support fabric so that it would not be seen from the front, the second to keep the fabric from billowing or disrupting the drape of the quilt, and the third to hold the outer edge of the support fabric smooth. All seams were designed to be easily removed and not to extend into the original quilt backing. The quilt can now be exhibited flat or draped without its dust-cover and stretcher support fabric hanging out.
The Calder sculpture *Nenuphar* has been displayed outdoors since 1968 and shows many of the condition problems typical of painted steel exposed to the elements. Some of these include chalking, flaking, and loss of paint, as well as rusting of the substrate and nut/bolt combinations used to attach the five wings to the central core element. It is intended that the original nuts and bolts be replaced with fiberglas-reinforced vinyl ester nuts and bolts as long as they can safely hold the wings without damaging the sculpture.
The sculpture *Death of Cleopatra* (marble, 63 x 31¼ x 46 in.), carved in 1876 by Edmonia Lewis, toppled while being unloaded at the loading dock of the Patent Office Building on Mar. 24, 2006. The accident resulted in injury to an employee of the shipping company. The estimated weight of the marble sculpture is 3100 pounds. The piece belongs to the collection of the Smithsonian American Art Museum (SAAM acquisition # 1994.17).
MCI 6061: Roux Cabinet
MCI Project Staff: Don Williams

The Roux cabinet was submitted for a complete conservation treatment.

MCI 6066: Portable XRF Demonstration
MCI Project Staff: Lynn Brostoff

SAAM requested a demonstration of MCI’s portable XRF on some of SAAM’s collections.
Smithsonian Institution Archives (SIA)

MCI 6013: Various Paper Documents and Enclosures
MCI Project Staff: Nora Lockshin, Ron Cunningham

Various paper documents and enclosures were submitted to identify heavy metal pesticide residues present in the collections.

MCI 6014: Identification of Photo Negative Layers
MCI Project Staff: Walter Hopwood

In surveying a collection of photographic negatives, Nora Lockshin was particularly interested in which and how many were cellulose nitrate (CN) stock. At minimum, CN materials should be isolated from photographs and other critical items that are not composed of CN. A portable infrared spectrophotometer (IRS) was invaluable in the survey. The IRS works with a delicately controlled plunger that brings the analyte surface into optical contact with an element by which the infrared beam passes into the analyte to a depth of about 2 micrometers. The chemical composition of the analyte determines how the infrared beam is attenuated, which can lead to its identification. Lockshin's spectral library of known materials was too limited for her to interpret spectra she had collected from a few photographic layers. The data station of MCI’s newly purchased infrared specrophotometer converted her spectra to a format compatible with about 10,000 digital library entries. The layers were quickly classified: proteinaceous material such as gelatin, cellulose acetate, and phthalate plasticizer.
Jia-sun Tsang, Senior Paintings Conservator, served as the exhibition conservator for the 2006 SI exhibition “Myth, Mortals and Immortality: Works from Museo Soumaya de México.” The conservation task was to provide collection care of objects for installation under the guidance of the clients. This included examination and documentation of the condition of objects as they were unpacked; advising contractors on safe handling of the objects; documenting the installation process; and providing and enforcing environmental standards such as proper humidity, temperature, and light level for the exhibition. Tsang worked closely with visiting conservators from the Souymaya Museo to secure local conservation materials and supplies for the installation. Most importantly, she participated in the installation of an oversize Diego Rivera sketch and suggested an alternative installation method to fit the curved structure walls. Organization of the digital photo files of the installation at the end of each day and distribution to clients the next morning in a timely manner were also accomplished. There are over 300 photo documents compiled for the exhibit.

Condition survey, “El Pez” by Juan Soriano, 1958-60
Unpacking of “Trazo para el mural pesadilla de Guerra, sueño de paz” by Diego Rivera, 1952, 32.8’ (W) x 13.45’ (H)

Installing “Trazo para el mural pesadilla de Guerra, sueño de paz” by Diego Rivera, 1952, 32.8’ (W) x 13.45’ (H)
Installing “Trazo para el mural pesadilla de Guerra, sueño de paz” by Diego Rivera, 1952, 32.8’ (W) x 13.45’ (H)

This remarkable exhibition, organized by the Smithsonian Latino Center and the Museo Soumaya in Mexico City, features over 100 works by some of Mexico’s most renowned artists, including Diego Rivera, Rufino Tamana, Jose Agustín Arrieta, Jorge Gonzalez Camarena, and David Alfaro Siqueiros. Many of the pieces, which span from the 16th to the 20th centuries, are being displayed outside Mexico for the first time.
Smithsonian Tropical Research Institute (STRI)

MCI 6021: Rock Samples from La Pintada Site, Panama
MCI Project Staff: Rae Beaubien, Ron Cunningham, Aaron Shugar, Lynn Brostoff, Walter Hopwood

Four rock samples, analyzed at MCI, were collected from the site of La Pintada, near Penonomé, Panama, which shows evidence of having been a pre-Columbian mining site of some kind. Among its features are a large gallery carved into the vertical face of a rocky outcrop, identified as basalt and tuff by archaeological project members, and a flat platform area in front of the entrance. Tool marks are evident on various surfaces, and various tools that could have been used for mining, including hammer stones, have been found there. Pronounced green coloration in the roof area of the chamber has led the researchers to hypothesize that copper was being mined, with some processing taking place on the cleared spaces nearby. If this interpretation is correct, it would be a significant contribution to research that has recently focused on the origins and development of metalworking in pre-Columbian Panama.

Because mineral products exploited for metal production are often highly colored, these components of the rock samples were of particular interest, especially the green covered fragments flaked from the chamber roof. Unfortunately, they proved not to be copper-bearing, as was hoped. The green material was identified as green algae, both by the morphological characteristics of the granules, as seen under a microscope, and by the cellular structure apparent at high magnification. This biological identification was further supported by the absence of a crystalline pattern with X-ray diffraction analysis, and the absence of a copper signature by portable X-ray fluorescence spectroscopy, as well as by indications of a proteinaceous material by Fourier transform infrared spectroscopy.

That said, there was clearly some ancient mining activity at the site, according to Aaron Shugar, and further investigation is warranted to determine the material for which mining tools, such as hammer stones found at the site, were being used.
The La Pintada site, showing gallery entrance and possible working surface in front

Collecting samples at La Pintada

View of the gallery ceiling’s green coloration
MCI 6029: STRI Library - Determine Level of Humidity
MCI Project Staff: Karla Munoz, Marion Mecklenburg, Paula Depriest, Robert Koestler

This project will measure the levels of humidity on the four levels of the STRI library, proposed an air-cleaning treatment, and made recommendations for a cleaning and drying system for the books.

Paula Depriest reported on an air cleaning treatment proposal and Marion Mecklenburg is providing help in contacting the people in charge of the building in Panama to give them advice.
Although numerous pre-Columbian gold artifacts have been found in Panama, most were long assumed to have been produced in Colombia and Ecuador, neighboring regions with ample archaeological evidence of metallurgy, including mining sites, manufacturing tools, and finished products. However, iconographic studies, ethnohistoric records, and, more recently, archaeological evidence of metallurgical activity suggest that Panama had developed its own gold-working tradition in pre-Columbian times.

Reconstructing the origins and development of Panamanian gold-working requires a nuanced understanding of key technical aspects of the objects themselves, one of the most important of which is alloy composition. This study focused on a group of 39 metal artifacts, 38 of which were excavated at the site of Cerro Juan Díaz, an important village and funerary precinct in the Azuero Peninsula. The study group included 18 gold and gilded artifacts – the largest number found at a single site in Panama.

Tiny samples from 17 of the sampled metal objects were analyzed using scanning electron microscopy-energy dispersive X-ray spectroscopy (SEM-EDS) to identify major and minor elements present. The EDS data were useful in guiding a second round of analyses using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS), carried out on 25 of the sampled metal objects. Quantitative information was collected on selected elements – gold, silver, copper, iron, manganese, nickel, zinc, and osmium (the latter included as it has been found in gold of Ecuadoran and southern Colombian manufacture). Of these, only gold, silver, copper, and iron were found.

The very good correlation between the findings from EDS and ICP techniques allowed the gold alloys to be provisionally sorted into the following general categories.

- **Gold (very high) + silver, copper** – 4 gold sheet fragments, 5 tubular beads, and 1 ring. The sheet fragments were similar in composition, with silver>copper.
- **Gold + copper (both mid-range) +/- silver** – 4 tubular beads, 1 ring, and 1 half-disk.
- **Copper (very high) with gilding** – 2 copper alloy figurines formed by casting, with surface gilding traces.
Analyses of one additional sample highlighted the importance of selecting appropriate locations for sampling (e.g., from technologically informative and not overly corroded areas), and of examining not just surface composition but also the bulk composition – especially if lamination or surface depletion techniques are used (both techniques are known to have been used in pre-Columbian metal-working). X-ray fluorescence analysis (XRF) of the sample’s outer surface indicated a copper-gold alloy, but a more complex picture emerged when the sample was mounted as a polished cross section and analyzed by SEM-EDS. Gold-rich phases were detected in the “islands,” surrounded by a copper-rich phase. Surface zones at the top and bottom of the sample displayed a different composition, with what appeared to be an extremely thin gold outermost layer.
MCI 6046: Panama Viejo 2006 Archaeological Field School
Conservation Workshop: In-situ conservation of human skeletal remains
MCI Project Staff: Rae Beaubien

In May 2006, MCI senior objects conservator Harriet F. (Rae) Beaubien taught a week-long workshop on conservation in situ at the archaeological site of Panama’s first colonial city, Panama Viejo, located on what is now the eastern edge of Panama City. The session was part of a field school directed by the site’s chief archaeologist, Juan Martín Rincón, offering instruction in archaeological field and laboratory methods. Participants in the conservation workshop included seven archaeological and conservation laboratory technicians from both El Patronato Panamá Viejo and the Smithsonian Tropical Research Institute (STRI), based in Panama City, along with eight undergraduate students in anthropology/archaeology from two universities in Colombia and a researcher from Panama’s Instituto Nacional de Cultura.

The focus for the workshop activities was a human burial excavated during installation of a freestanding stairway for public access within the newly restored tower at the site. The session introduced the priorities and perspectives of the archaeologist, physical anthropologist, and conservator in determining an appropriate course of action for excavation and preservation. In this case, a decision was made to rebury the skeletal remains in situ, after basic stabilization and documentation. Working in small teams, the participants learned a variety of conservation interventions, carried out in a minimalist fashion with stable but reversible materials. These included cleaning, localized consolidation of fragile areas, and reattachment of bone fragments. At the end of the session, participants produced a conservation report for the burial, to be included in the site’s excavation records.
MCI 6057: Pre-Columbian Collections from the Anthropology Museum of Panama
MCI Project Staff: Karla Muñoz-Alcocer

The Anthropological Museum in Panama known as MARTA received advice from MCI by phone and on site in the following areas: collections management database; exhibit script; object list; display cases design for gold artifacts; collaboration on the selection of themes and objects for the gold exhibit section; edit and design two posters that explain the gold research project, for display at the museum in the near future.
Topics in Museum Conservation Lecture Series

October 27, 2005
The Preservation of the Lodge of Retirement in the Forbidden City
Dr. Marion Mecklenburg, Senior Research Scientist, MCI

In June 2005 members of the Smithsonian staff were asked to assist in the conservation of the Lodge of Retirement in the Forbidden City in Beijing, China. This presentation gave an overview of that effort, concentrating on the structural assessment and planned environmental systems. This late-18th-century structure is primarily wood with masonry fill (non-load-bearing) between the columns on three of the walls. The lower part of the fourth wall is wood with doors, and the original openings above the wood walls have been enclosed with windows. Among the conservation issues addressed were structural analysis, roofing integrity, windows, and waterproofing. We were asked to guide the design of internal humidity and temperature requirements and provide expertise on the conservation of the interior decorations. In addition, we were asked to help plan the future use of the building and its contents.

January 11, 2006
Today’s High-Accuracy Laser Measurement Systems and their use in Inspection, Reverse Engineering, and Design Validation
Steven D. Hand, Senior Metrologist, MAGLEV, Inc.

The presentation reviewed current technologies available for high-accuracy laser measurement and scanning systems, with an emphasis on testing and evaluation applications. Examples of projects using scanning technology as the primary means of data acquisition were detailed, along with results from other projects where data were taken in adverse conditions and analyzed using surface model comparisons.

January 13, 2006
EPA’s Tribal LifeLine™ Project: An Overview Calculating the Exposure and Risk to Tribal Communities from Chemicals in the Diet and Environment
Elizabeth Resek, Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances

Over the past two decades, the Environmental Protection Agency has used software models to make the link between residues of toxins in food or the environment to human health consequences. Those software tools have evolved as the underlying sciences and computer technologies improve. This presentation looked at how exposure and risk scenarios are captured in the software, with focus on the exposure profiles and risk assessment options relevant to museum objects. Resek discussed the collaborations being set up with U.S. agencies, as well as international groups, to expand these capabilities through a cost-sharing plan. Prior to 2004, the risk assessment tools used by EPA, including the early versions of the LifeLine™ software, only
considered the general population, and not those persons living unique or traditional lifestyles. The new Tribal LifeLine™ software takes into account traditional diets (hunting, fishing, and gathering), seasonal changes in lodging, use of sweat lodges, and other exposure scenarios. For the first time, tribal communities are “visible” when assessing exposure and risk to chemicals.

January 26, 2006
Material Identification Using Raman Spectroscopy: Teeth, Bone, and Other Curiosities
Odile Madden, Conservator and Ph.D. Candidate, Heritage Conservation Science Program, Department of Materials Science and Engineering, University of Arizona

This presentation highlighted results of analysis conducted at the Los Angeles County Museum of Art on the effects of laser radiation on ivory and the identification of minute amounts of inlay and colorant materials used on Japanese netsuke. The utility of Raman spectroscopy was shown for the identification of organic and inorganic materials that are commonly encountered in artifact and natural history collections. An overview of Raman spectroscopy was presented, with particular emphasis on tooth and bone, and parameters (such as wavelength selection) that are relevant to planning conservation research were addressed.

February 17, 2006
The Sex Life of Cockroaches & Other Cautionary Tales
Mary Ballard, Senior Textile Conservator, MCI

During the past 25 years, the legislated climate for pest control has changed with advances in science, ecological and political concerns, new industrial strategies and formats, and educational developments in teaching urban entomology. Chemical toxicology, the Montreal Protocol, IPM (integrated pest management), and alternative treatments have swept out many older compounds and treatments—altering both the biological pressure and the chemical climate on museum collections going forward and even on our own homes. Yet, have the bugs been informed of these new directions? In what ways has the biological pressure really changed, and will it be easier or harder to maintain museum collections? Why is the sex life of cockroaches relevant to conservators, conservation scientists, curators, and collection managers? A brief overview of past museum practices, current trends in pest control, and possible hazards to artwork, artifacts, and staff was presented.
March 23, 2006
Chalcolithic Metallurgy: A Re-evaluation of the Chemical Composition of Nahal Mishmar Hoard by Portable XRF
Aaron Shugar, Ph.D., MCI Visiting Scientist; Conservation Scientist, Art Conservation Department, Buffalo State College

Scholars have long been fascinated with the provenance and fabrication techniques of the Nahal Mishmar hoard of copper objects. Discovered in the mid 1960s, the objects date to the Chalcolithic period in the Southern Levant (c. 4500-3600 BCE). Traditional destructive chemical analysis has been limited because the hoard is considered too valuable for full sampling. However, recent developments in miniature X-ray tube technology have led to handheld portable XRF (X-ray fluorescence) machines, which can be used for in-situ non-destructive analysis. In cooperation with the Israeli Antiquities Authority and the Israel Museum, the entire hoard of copper objects was analyzed by portable XRF. Results of this work were compared to recent studies showing that the majority of remnant mold material comes from the Shfela region in Israel. A review of the metallurgical traditions of the Ghassulian Culture was presented, and a possible link between groups of compositionally similar objects in these regions was discussed.

April 6, 2006
Sensing Sensitivity: Assessing Light Damage Risks with Noninvasive Exposure Tests on Artifacts
Paul Whitmore, Director, Art Conservation Research Center, Carnegie Mellon University

Conventional methods used to analyze and monitor colored artifact materials are usually insufficient to predict, and thus prevent, damage to the colors from light exposure. A device has been developed that can provide this information by fading tiny areas on objects. These tests can be done rapidly and without damage to the artifacts. In this lecture, the design and performance of this fading tester were described. Results of fading tests on a variety of objects were presented, illustrating both conventional and unconventional uses of the device.

April 27, 2006
Methodologies for the Analysis of Archaeological Food Residues: Application to the Diet of Arctic People
Caroline Solazzo, Pre-Doctoral Fellow, MCI

Artifacts from archaeological sites in Alaska and Canada were selected at the NMNH and residues were analyzed to determine their lipid and protein composition. Cooking residues are analyzed to determine and understand the diet and cooking practices of past cultures: food consumed, cooking methods, evolution of a diet through time, and geographical particularities. These residues are found absorbed in the clay matrix of ceramics or trapped as a charred layer adhering on the surface of pots. Methods to analyze proteins on archaeological artifacts have in the past given few reliable results, especially because proteins are denatured and modified when
they are processed. An original methodology developed in this study and derived from new developments in proteomics offers promise in identification of species-specific proteins.

May 23, 2006
The Mummy Portraits at University College London: Thirty Years of Conservation Research
Noëlle Streeton, Department of History of Art, University College London

The collection of mummy portraits at the Petrie Museum of Egyptian Archaeology at University College London comprises 38 encaustic portraits and nine fragment groups, making this the largest collection of its kind in the world. The portraits date from the Roman era in Egypt between the first and fourth century AD, and because of their age, historical value, state of preservation, and treatment histories, they are of immense interest to conservators. This talk looked at ways in which the treatment of this collection, both in the field directly following excavation and in the lab since the 1970s, reflects broader developments in conservation practice and materials research.

May 31, 2006
William Rimmer’s Falling Gladiator: A Puzzle in More Ways than One
Carol Grissom, Senior Objects Conservator, MCI

The reopening of the Smithsonian American Art Museum in 2006 presented the perfect opportunity for thorough conservation and technical study of a plaster statue of a Falling Gladiator (1861). This original model was given to the Smithsonian in 1915 by the daughter of its creator, William Rimmer (1816-1879), often considered the most gifted sculptor of his time working in the U.S. and sometimes referred to as the Yankee Michelangelo. Historic photographs reveal that the statue was already damaged by 1882. In the 1940s it was badly broken by a falling ladder. The statue was painted many times throughout the years, no doubt to cover both damage and dirt. Moreover, it was molded twice, first in 1862 for a plaster copy sent for exhibition in Europe and again in 1905 for making bronze castings. Substances applied to free it from molds used to make the copies would have caused subsequent layers of paint to stick poorly. So, by the 1990s layers of repaint and filling material disguised much of the figure’s sculpted detail. The surface had become a magnet for visitors’ fingers that could not resist peeling paint. This talk described recent treatment of the statue and results of technical study, including X-radiography. Curatorial questions discussed regarded changes made to the statue since casting and whether it was a professional or amateur casting.
June 8, 2006
From Fabric Dyes to Fluorescent Paints: Care of Acrylic Paintings in Collections
Jia-sun Tsang, Senior Paintings Conservator, MCI

This talk described the present state of conservation on acrylic paintings, as well as the challenges in developing appropriate conservation protocols and guidelines to handle and move acrylic paintings from storage to display – including basic condition assessments, non-invasive evaluations, and ways to protect the artwork in transit. Acrylic paints became immediately popular when they were first commercially promoted in the 1950s. Acrylic paint dries fast, carries all kinds of pigments, bonds well to various surfaces, and can provide both the clarity of watercolor and the density of oil paint. From Liquitex fabric dyes used by abstract painter Larry Poons to the fluorescent paints employed by David Hockney, acrylics are ever-present in galleries and museums. Acrylic paintings have their own unique set of physical and chemical properties, as well as responses to aging, environmental conditions, and conservation treatments. Most of the care and handling guidelines for paintings were designed for oil paintings, and are therefore not necessarily suitable for acrylic paintings. Some characteristics of acrylic paints make cleaning and any remedial treatment unfeasible.

June 29, 2006
The Prodigal Chairs
Donald Williams, Senior Furniture Conservator, MCI

A recent project provided the intersection of two ongoing initiatives between MCI and the Office of History and Preservation, U.S. House of Representatives. First, the House is attempting to rebuild a collection of long-lost artifacts from the institution’s storied past, and second, House staff are attempting to care for all their historic collections with conservation-based practices and strategy. The prodigal chairs are three recent re-acquisitions by the House, and this presentation focused on their interpretation, preservation and restoration with minimally intrusive upholstery and other innovative techniques, as a prototype for collections care.

September 14, 2006
King Midas’ Golden Touch Rediscovered
Mary Ballard, Senior Textile Conservator, MCI

According to legend, King Midas was a Phrygian king who could turn anything he wanted into gold. In 1957, the archaeologists from the University of Pennsylvania began excavation upon the largest tumulus in central Turkey, a tomb dating to his reign. While there were no indications of tomb robbers, no gold was ever found—there was bronze, iron, leather, furniture, textile fragments, a body—but no gold. MCI was approached to help identify some textile specimens associated with the bier and other furniture. This talk reviewed the analytical work undertaken at MCI on the textiles, which had some surprising results.
September 15, 2006
Mural Paintings Research: State of Color Layers, Chemical Cleaning, and Retouching
Polonca Ropret, Restoration Center, Institute for the Protection of Cultural Heritage of Slovenia; Visiting Scientist at MCI; Ph.D. Candidate, Faculty for Chemistry and Chemical Technology University of Ljubljana, Slovenia

This presentation described the research of a case study on the restoration and conservation treatment of Giulio Quaglioni mural painting (1705 – 1706) in the Cathedral of Saint Nicholas in Ljubljana, Slovenia. The degradation level of paint layers before treatment, the choice of the chemical cleaning procedure, and the retouching binder were discussed, as well as the results gained by scanning electron microscopy/energy dispersive spectroscopy (SEM / EDS), Fourier transform infrared (FTIR) microscopy, and X-ray diffraction (XRD) techniques.

September 21, 2006
Characterization of Synthetic Organic Pigments and Dyes, and Heterogeneous Natural Organic Pigments by Raman Spectroscopy
Silvia A. Centeno, Associate Research Scientist, The Metropolitan Museum of Art

Raman spectroscopy is established as an analytical technique that is particularly specific, sensitive, and spatially refined for the analysis of works of art. The technique is now being applied to many areas of conservation science, for example to the study of pigments, stone, glass, ceramic materials, corrosion products, and biomaterials. Reference libraries for the characterization of many pigments and minerals have been published by several authors. However, less attention has been paid to the analysis of synthetic organic pigments such as those developed after the first synthesis of Mauve in 1856, and used in early lithographic inks or modern paint; or to the analysis of heterogeneous organic pigments such as melanin sepia or Van Dyke brown, that give weak signals in the normal Raman spectra and require the use of enhancement methods such as SERS (surface enhanced Raman scattering).

September 28, 2006
How Important are Biofilms in Conservation?
Christopher J. McNamara, Ph.D., Research Associate in Applied Biology Laboratory of Microbial Ecology, Division of Engineering and Applied Sciences, Harvard University

Biofilms are complex microbial communities attached to surfaces. The majority of microorganisms in most environments are found in biofilms, and art or historically important objects are no exception. For example, our research at Harvard has studied microbial biofilms on synthetic textiles from Apollo spacesuits, wax statues and paintings, polymeric coatings for outdoor bronzes, steel from the USS Arizona, and limestone from Maya archaeological sites. Many studies have reported the presence of microorganisms on art and historic objects and documented significant aesthetic changes caused by microbial growth. A more difficult task is to determine the contribution of microbial biofilms to deterioration of these objects relative to physical and chemical causes. The talk explored recent work on biofilms and microbial growth on cultural heritage materials.
MCI Consultations

**Cooper Hewitt National Design Museum (CHM)**
- Textile conservator stylistic/art historical information on potential exhibition issue
- Sampling and ACS method of C-14 measurements of a pre-Columbian fabric

**Freer Art Gallery/Sackler Art Gallery**
- DCSR on technical study of bronze objects excavated by the Khanuy Valley Project
- Preliminary discussion about FSG collaboration with Global Heritage on new Indus Museum, Baroda, India, on on-site training, collections stabilization

**Hirshhorn Museum and Sculpture Garden**
- Discussion of Hirshhorn renovation
- Advise collections manager on the reinstallion of the museum's hydrothermographs
- Discuss with collections manager the preliminary recommendation cited in the preliminary report for the Hirshhorn Renovation

**MCI**
- UV tutorial for MCI conservators
- Golden acrylic test pieces
- Meeting with House of Representatives curator and staff from the office of the Sergeant at Arms to discuss the deterioration of the surface coatings on the House Mace
- Professor at VPI - discussion on pursuing joint research in polymer coating design; accepted an invitation to speak at MCI in June
- Johns Hopkins University - consultations/advice to archaeology colleague
- A speaker for Washington Conservation Guild, reviewed exhibition case information and gave feedback on his upcoming presentation
- Recommended to director of Instituto la Raza a conservator to assist with their problems on a painted photograph in Puerto Rico
- Consultations with Tulane University and SMU on lifting, conservation, and analysis issues of a tomb deposit of painted organic objects, and conservation of stucco sculpture, excavated in 2005, now in Guatemala City
- Lawrence Berkeley National Laboratory, Berkeley, CA, collaborative work on LA-ICP-MS
- Work with Ph.D. candidate from Polytechnic University of Valencia
- Scientist at the Metropolitan Museum of Art in New York, regarding a possible collaboration on research into synthetic organic pigments
- Harvard Center on ICP-MS of Han bronzes
- Sent testing equipment to the Polytechnic University of Valencia (the second university that MCI has helped set up a full mechanics program)

**National Air and Space Museum**
- Consultation on the condition and treatment of 19th-century balloon fabric; MCI proposal submitted
- Curation and conservation on treatment plan and funding proposal of *Lunar Landscape*
• National Air and Space Museum-Garber
  - Collections Division, requesting information about locating underground utilities
  - Collections Division, requesting information about off-gassing of materials in the space suit storage facility

• National Museum of African Art
  - Conservation presentation for NATCC Conference

• National Museum of American History
  - Curator on information of 1880 California missions painting
  - Preservation Services on application for equipment pool (IR & UV)
  - Off-gas in storage (electricity and lighting)
  - Curator on XRF application for art and artifacts
  - Assistance on AIC/textiles protocol
  - Surface coating on painting of clipper ship
  - Preservation Services on materials in re-housing CIGNA collections

• National Museum of the American Indian
  - Conservation Department on conservation on-site at Ceren for 2006
  - Collections on South American ceramic technology and sources
  - Collections and conservation advice on a possible technical study project of two Mexican mosaic masks, in conjunction with outside researcher Sue Scott
  - Asst. Dir. for Operations, NMAI, NY; information and recommendations about building and collection shock and vibration; having a problem with construction blasting adjacent to their building
  - OPP-Visitor Services, information on building environment work and the effects on older, simpler, buildings
  - Test-XRF analysis on turquoise of NMAI masks and shields
  - Discussion of LA-ICP-MS analysis of archaeological copper alloy objects from the southwest

• National Museum of Natural History
  - Conservation of animal remains from Zawi Chemi Shanidar, Archaeobiology Program
  - Anthropology Conservation Laboratory (ACL) on textile structure
  - Arctic Studies Center on technical study of bronze objects excavated by the Khanuy Valley Project
  - Arctic Studies Center on Mongolia 800 exhibit at NMNH in October 2006
  - Anthropology on 3-D scanning an ivory artifact for tool and cut marks in early May; discussion about resolution
  - Archaeological collections manager on collections review protocols, archaeological collections research, and procedures for using the collections database
  - Anthropology for review of collections and instruction on E-Mu collections database on possible research project on stucco/painted artifacts from Mesoamerica
  - Vertebrate Zoology on 3-D scanning of whale skulls in the collection
  - Anthropology on wood sample from Egiin Gol and conservation advice on archaeological lacquer (Siberia)
- Anthropology consultant on participation in technical survey of Mimbres ceramics, on-going with American Museum of Natural History and Arizona State Museum; possible inclusion of University of Colorado/Boulder Museum
- Archaeobiology Program, on documenting, stabilizing, and rehousing animal bones from #6 of 6 ritual animal caches at Teotihuacan; advice on strategies
- Archaeobiology Program about collection priorities and conservation needs, and possible joint proposal submission to the Smithsonian Collections and Care Fund (SCAC) re archaeobiology (botany, faunal) collections
- Possible cleaning methods for modern (ca. 1961) Pakistani garments (ACL)
- Advice about tubing and inflationary padding for rolled storage (ACL)
- Structures and exhibition cases
- Information for museum in Alaska for ACL review of exhibition specifications and environmental and structural information on cases proposed for an installation of ethnographic materials in Alaska (SI traveling exhibition)
- Mineral Science on LA-ICP-MS of mineral samples

• **NMNH-Museum Support Center (MSC)**
  - Building Manager, MSC, review shock and vibration data used to monitor the Pod 5 construction site; this data suggests that there is a high probability of objects vibrating off storage shelves
  - MSC-Collections Services Office, information on designing a small and portable fumigation case for transporting possibly contaminated artifacts – development of sealed transportable fumigation chamber

• **National Portrait Gallery**
  - Conservation on IR digital imaging

• **Office of Exhibit Central (OEC)**
  - On difference in Oddy and solid phase micro-extraction GC analysis for measuring off-gas problems in exhibits

• **Office of Facilities and Engineering and Operations**
  - Horticulture on repair of a cast-iron garden bench
  - Zone Manager requested a review of the proposed environmental setting for the courtyard at the Post Office Building (POB) when the canopy is installed
  - POB exterior column cleaning information requests
  - POB information on laying and cleaning marble floor tiles
  - Architect request for SDS-410 review and revision, SI Standard Specifications for exhibits
  - Leak project at the Castle, Zone Manager, took FLIR images
  - Organized conference on sealants and coatings for 80-90 SI Facility Managers

• **Office of Safety, Health, and Environmental Management (OSHEM)**
  - Requested safety training on portable XRF
• **Office of the Under Secretary for Science (OUSS)**
  - OUSS silk embroidered painting; reframe
  - Repair of Chinese artwork

• **Smithsonian American Art Museum (SAAM)/Renwick**
  - Began active collaboration on the treatment of the Roux cabinet
  - Conservators (Renwick & SAAM) on “high fiber” next steps
  - Conservator on evaluation of Oddy results performed on test fabrics
  - Chief Curator, review of the floors in the Luce Center at the POB; there was no problem
  - Objects Conservator, assistance in the reinstallation of *Vaquero* by Luis Jimenez, a large polyester sculpture installed at the north entrance to the POB

• **Smithsonian Journeys**
  - Request information on the Forbidden City project for “Field Notes”

• **Smithsonian Institution Libraries (SIL)**
  - Conservation advice for flood-damaged objects, St. Bernard's Parish, LA; damaged by Hurricanes Katrina and Rita

• **Smithsonian Tropical Research Institute (STRI)**
  - Preliminary planning about archaeological collections survey
  - Preliminary planning about conservation assistance as part of archaeological field school course through Panama Viejo, with STRI personnel involvement
  - On-site visit, meetings, consultations, facilities tours and La Pinada site visits: with archaeology and other archaeology support staff; with STRI librarian; with archaeology post-doc fellow
  - Archaeology possibilities of LA-ICP-MS analysis of gold