# NICS ANNUAL SYMPOSIUM 2019

# BOOK OF ABSTRACTS

The Metropolitan Museum of Art

# NICS Annual Symposium 2019

# Book of Abstracts

The Network Initiative for Conservation Science, launched in September 2016 with the support of The Andrew W. Mellon Foundation, is a program designed to offer access to The Met's state-of-the-art scientific research facilities to partner institutions in New York City. In the past three years, NICS scientists have carried out collaborative work on over 50 projects, resulting in the examination and scientific analysis of nearly 280 objects. Works of art investigated span 2,500 years and represent cultures from all over the world. Highlights from the 2019 NICS Annual Symposium include research in collaboration with the American Museum of Natural History, the Brooklyn Museum, the Central Park Conservancy, The Hispanic Society Museum & Library, The Morgan Library & Museum, and the New York Public Library.

# Schedule of Events

9:30 am — Registration and Breakfast

10 am — Welcome and Introduction
Andrea Bayer and Marco Leona,
The Metropolitan Museum of Art

10:15 am — Plenary Lecture
*To Preserve, Understand, and Inspire: The Future of Science in Conservation Is Collaboration*
Francesca Casadio, The Art Institute of Chicago

11 am — *License to Alloy: A Study of Tiffany & Co.'s Silver Produced under Edward C. Moore's Tenure* pg 04
Federico Carò, The Metropolitan Museum of Art

11:30 am — Coffee Break

11:45 am — *Improved Positives and Preliminary Photographs: Understanding the* Arctic Exploration *Album* pg 12
Jessica Keister and Elizabeth Cronin,
New York Public Library

12:15 pm — *In Search of Humboldt's Colors: Materials and Techniques of a Colonial Spanish-American Lacquered Gourd* pg 20
Monica Katz, The Hispanic Society Museum & Library

12:45 pm — Lunch Break



2 pm — Plenary Lecture
*Unlocking Artists' Techniques through Proteomics in the Network Initiative for Conservation Science*
Caroline Tokarski, University of Bordeaux, France

2:45 pm — *Color, Collation, and Curious Creatures: 15th-Century Block Books at The Morgan Library & Museum* pg 28
Reba F. Snyder, The Morgan Library & Museum

3:15 pm — *A Miniature Diorama of a Kwakwaka'wakw Village: History, Analysis, and Conservation* pg 36
Linda Lin, American Museum of Natural History

3:45 pm — Coffee Break

4 pm — *Monitoring the Conservation Treatment of the* Samuel F. B. Morse *Memorial's Bronze Statue in Central Park* pg 44
Matthew C. Reiley, Central Park Conservancy

4:30 pm — *Beyond the Connoisseurship Approach: Creating a Chronology in Hokusai Prints Using Noninvasive Techniques and Multivariate Data Analysis* pg 52
Marc Vermeulen, Northwestern University–Art Institute of Chicago Center for Scientific Study in the Arts (NU-ACCESS)

5 pm — Closing Remarks
Federica Pozzi and Elena Basso,
The Metropolitan Museum of Art

# License to Alloy: A Study of Tiffany & Co.'s Silver Produced under Edward C. Moore's Tenure


## CONTRIBUTORS

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## PRESENTING AUTHOR: FEDERICO CARÒ

Federico Carò received his doctorate in Earth Science from the University of Pavia, Italy, where he worked on the characterization of natural and artificial building materials. At The Met, he investigates inorganic materials and techniques employed in artistic production, in close collaboration with conservators and curators. His research interests focus in particular on the mineralogical, petrographic, and geochemical characterization of stone and other geological materials in provenance and conservation studies. Since 2007, he has been involved in the study of Southeast Asian sculptural and architectural stone materials.




In July 2020 an exhibition titled *Collecting Inspiration: Tiffany & Co.'s Edward C. Moore* will open at The Metropolitan Museum of Art, New York, to celebrate the creative force of Edward C. Moore (1827–1891), director of Tiffany's design department who led Tiffany & Co. to unparalleled originality and success during the second half of the nineteenth century. During his life, Moore, a silversmith and avid collector, amassed a vast collection of works of art ranging from Greek and Roman glass to Japanese ceramics and baskets. His large private library included hundreds of volumes dedicated to science, nature, and industrial technology. The exhibition will bring together representative examples from his extraordinary collections and magnificent silver designed under his direction and supervision. Presenting Moore's diverse and fascinating collection alongside the exquisite silver created at Tiffany's during his tenure offers enlightening and stunning glimpses into the sources of inspiration and working methods of a defining figure in the history of American silver.

In preparation for the exhibition, The Met's Department of Scientific Research has been collaborating with The American Wing and the Department of Objects Conservation towards a deeper understanding of the manufacturing techniques and materials of Moore's silver objects. Tiffany's silversmiths skillfully worked together several different metals, including alloys of gold, silver, copper, and iron, and experimented with alloying, casting, electrotyping, chasing, etching, inlaying, electroplating, and patination, often getting their inspiration from Japanese and Near and Middle Eastern metalsmithing traditions. Several mixed-metals works designed and created under Moore's direction have been analyzed noninvasively with X-ray fluorescence spectroscopy by means of portable instrumentation. The comprehensive body of work initially carried out at The Met over the course of one year, focusing on nearly twenty silver objects, was more recently expanded to include three pieces in the collection of the Brooklyn Museum through a collaboration with NICS. Quantitative alloy compositions were then calculated using a fundamental parameter-based method, and validated with certified reference standards.

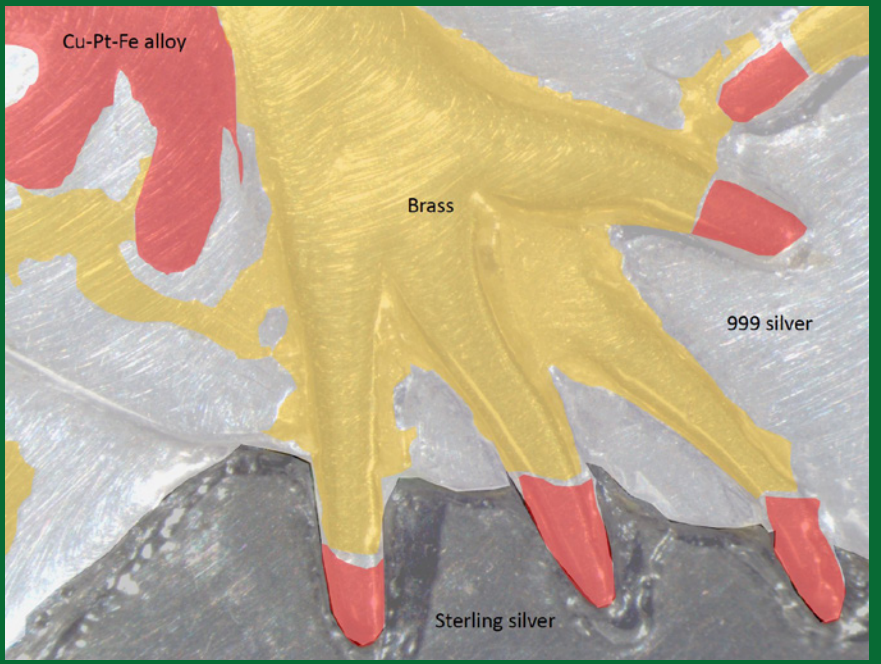
Results from this investigation shed new light on the alloys tested and employed by Tiffany & Co. during Moore's direction, and provided a unique opportunity to compare the data collected to original notes

of an unpublished Tiffany's technical manual. In addition to pure metals, such as copper, silver, and gold, several alloys were found to have been used to decorate sterling silver objects, including different types of brass; binary alloys of copper and gold, copper and platinum, and gold and silver; and ternary alloys of copper, platinum, and iron, copper, silver, and gold, and silver, copper, and zinc. These same metals were often patinated using different solutions to achieve various tones and effects, and were combined together to produce laminated inlays with elaborate patterns, similar to those observed in the Japanese technique of *mokume-gane*.



Tiffany & Co. (1837–present). *Tray*,
1879–80. Diam. 9 1/8 in., D. 7/8 in.,
Weight 17.5 oz. (Diam. 23.2 cm,
D. 2.2 cm, Weight 544.3 g).
The Metropolitan Museum of Art, New York,
Rogers Fund, 1966 (66.52.2).

A detail of The Met's tray (66.52.2), showing the use of different metal alloys to render the frog's body (here, one of the frog's feet).




A graphic illustrating the type and distribution of metal alloys detected by analysis with X-ray fluorescence spectroscopy.

Edward C. Moore (American, 1827–1892). *Vase*, ca. 1874. H. 9 1/2 in., Diam. (top) 3 3/4 in., Diam. (base) 8 1/2 in. (H. 24.1 cm, Diam. [top] 9.5 cm, Diam. [base] 21.6 cm). Brooklyn Museum, New York, H. Randolph Lever Fund (82.18).

# Improved Positives and Preliminary Photographs: Understanding the *Arctic Exploration* Album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## PRESENTING AUTHORS : JESSICA KEISTER AND ELIZABETH CRONIN

Jessica Keister was formerly Associate Conservator for Photographs at the New York Public Library. Prior to that, she spent six years as Paper and Photograph Conservator at the Conservation Center for Art & Historic Artifacts in Philadelphia. She received a master of science in Art Conservation, with a primary concentration in photographic materials and a secondary concentration in works on paper, from the Winterthur/University of Delaware Program in Art Conservation.

Elizabeth Cronin is the Assistant Curator of Photography at the New York Public Library. She holds a doctorate in Art History from the Graduate Center, City University of New York. She is the author of "Heimat Photography in Austria: A Politicized Vision of Peasants and Skiers" and has published several articles on the topic. Cronin is currently working on an exhibition surveying the history of visual depictions of the Arctic.




Arctic expeditions were thoroughly chronicled events: every object itemized, every image captured, every moment experienced. All was documented, dissected, and later disseminated to an eager public through magazine articles, books, lectures, and lantern-slide extravaganzas. Photography was an integral part of this process. The Photography Collection at the New York Public Library holds an item that confounds all aspects of this exhaustive practice: a photographic scrapbook, titled only *Arctic Exploration*.

In the early twentieth century, the Library assembled photographs from various Arctic expeditions into one scrapbook. Gifted from publishing houses and spanning a thirty-year period of exploration, the majority of photographs have been "improved" and are heavily reworked with overpainting and masking, as well as drawn and collaged elements. They were not intended as completed artistic or documentary works in themselves. They were transitional objects, an intermediate phase between negative and photo-mechanical illustration, and were reproduced as letterpress halftones in Frederick George Jackson's 1899 book *A Thousand Days in the Arctic*, the published account of an 1894–97 expedition to Franz Josef Land.

The success of a halftone reproduction depends on the contrast of the original image. Photographs with more contrast and a wider tonal range reproduce better. Obtaining a high contrast was a consistent, known problem when it came to photographing the Arctic. Rudolf Kersting, photographer on an 1891 expedition, advises others working in the Arctic that "one should have a good dark room, and develop some plates daily to enable [one] to keep in touch with the quality of light." Retouching was required in order for a low-contrast photograph to be successfully reproduced as a halftone. The *Arctic Exploration* album is remarkable in that it includes two pairs of what appear to be the preliminary photograph and corresponding improved positive.

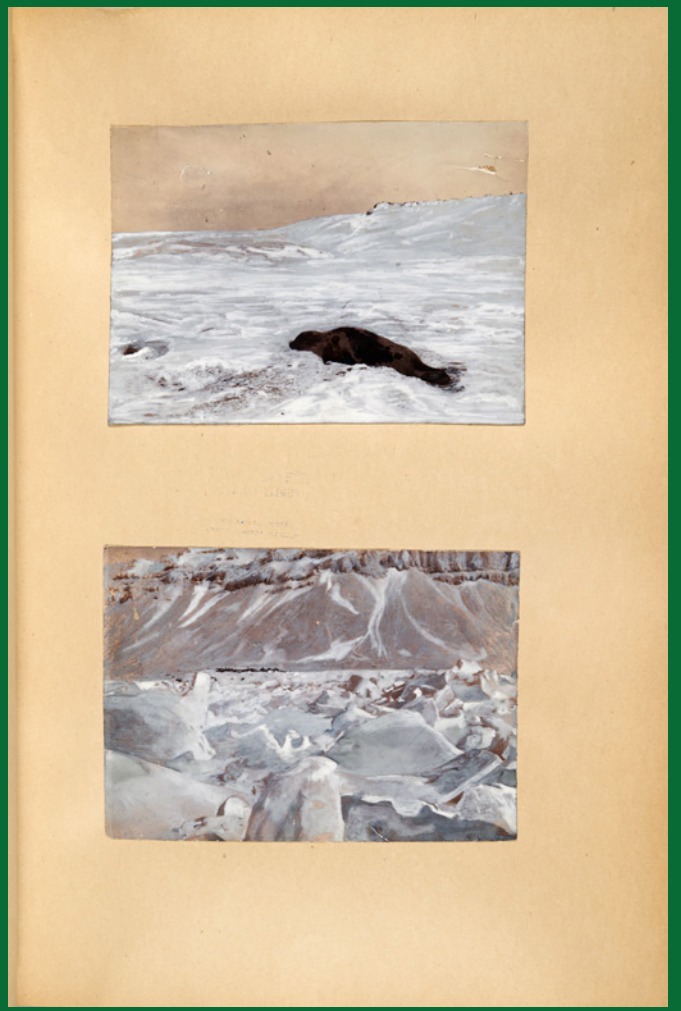
It was hypothesized that the preliminary photographs, which are small and in poor condition, were printed on site in the Arctic. Print processing in the far north may not have been thorough. Water was not readily available for polar adventurers, despite their being surrounded by ice and snow. As Jackson wrote, "Photography is carried on under difficult conditions here, and even after a negative has been successfully obtained, every drop of water used in developing and washing has to be obtained from melted snow". X-ray

fluorescence (XRF) spectroscopy conducted by the NICS team did not find any elements that would indicate incomplete processing but did detect evidence of gold toning.

The extensive retouching present on the improved positives also provided an opportunity to compare the materials used with those listed in nineteenth-century photographic publications, many of which are held in the research collection of the Library's Wallach Division of Art, Prints and Photographs. A variety of analytical techniques was used by NICS scientists to describe the retoucher's palette. While noninvasive analysis with a portable XRF spectrometer identified the elemental compositions of the applied colors, fiber optics reflectance spectroscopy and Raman spectroscopy provided a more detailed characterization of the palette employed. Removal of minuscule samples and microinvasive analysis with scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy, Fourier-transform infrared spectroscopy, and a benchtop Raman system further specified the paints' composition and narrowed down the number of organic components present to those used in the binders and photographic emulsions.

The present project increases knowledge of the technical aspects of photographically illustrated books during the late nineteenth and early twentieth century and allows for a comparison between materials used for retouching improved positives with those described in contemporary texts. The quality of the retouching materials that were utilized supports the view that the collection is unusual and that the photographs were mostly valued for their ability to translate an experience. The examination and scientific analysis of the *Arctic Exploration* album contributes to the understanding of photography as a tool of exploration, both in documenting discoveries and adventures and in disseminating them to an eager public.





A whole page from *Arctic Exploration: A Harp Seal/The Fantastically Irregular Surface of the Great Ice-floes, Cape Flora from the Floes by Moonlight*, MFY+ 96-4073. Miriam and Ira D. Wallach Division of Art, Prints and Photographs, Photography Collection. New York Public Library, Astor, Lenox and Tilden Foundations.

*Dog-Team Under Way with Sail*, without retouching, from *Arctic Exploration*, MFY+ 96-4073. Miriam and Ira D. Wallach Division of Art, Prints and Photographs, Photography Collection. New York Public Library, Astor, Lenox and Tilden Foundations.



The enlarged and heavily retouched improved positive version of the same photograph.

NICS scientists Federica Pozzi and Elena Basso conduct in-situ X-ray fluorescence analysis of photographs from the *Arctic Exploration* album with New York Public Library conservator Jessica Keister.

# In Search of Humboldt's Colors: Materials and Techniques of a Colonial Spanish-American Lacquered Gourd


## CONTRIBUTORS

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## PRESENTING AUTHOR: MONICA KATZ

Monica Katz has been a conservator at The Hispanic Society Museum & Library since 2001. She is responsible for the treatments of ceramics, wooden objects (including furniture and South American lacquered artifacts), and ivories, as well as surface treatments on metals, stone, and textiles. She has been studying South American lacquers since 2003. She holds degrees from the London School of Economics and the Fashion Institute of Technology in New York.




In 2014 The Hispanic Society Museum & Library acquired a colonial Spanish-American lacquered gourd, which constitutes an important addition to its growing collection of lacquers, an area of colonial decorative arts that has been little studied. This gourd was made in seventeenth-century Colombia by local artisans in imitation of Asian lacquers and for a European aesthetic. It was created using an indigenous technique called *barniz de Pasto* that employs local, raw materials, including natural dyes and a plant resin known as *mopa mopa*, which is harvested from a tree (*Elaeagia pastoensis* Mora) that grows in the Andean rainforest and that produces the resin as a protective covering for its leaf buds in spring.

In the viceregal period, the resin was collected and then taken to one of the centers of production for *barniz de Pasto* objects, principally Pasto, a town in the southwest of modern Colombia, and, to a lesser extent, Quito in Ecuador. There, the resin was processed, colored with dyes, and applied with heat to a wide variety of decorative wooden artifacts, in indigenous as well as European and Asian forms. Despite some early references to the use of a resin to decorate indigenous objects, as well as favorable comparisons to Asian ceramics, it was not until Alexander von Humboldt, German naturalist and explorer who travelled through the region in 1801, that anyone described the manufacturing technique and colorants used.

Because these lacquered objects are typically densely decorated, art historians have relied on both the quality of the work and the decorative motifs to date them: the earlier pieces, for instance, have finer details and decorative elements borrowed from European Books of Hours and other illustrated manuscripts. The gourd under study has been dated to the second half of the seventeenth century and is of particular interest because, unlike the majority of surviving artifacts, it is an indigenous form and is one of only a few extant lacquered gourds from this period. It is also an early example of the *barniz brillante* technique, in which the processed resin was dyed and applied in jewel-like colored sheets over silver leaf to give a lustrous finish.

In 2018 the contributors to this abstract began a study using photography and microscopic examination to identify the inspiration for the decorative motifs on the gourd. The main goal was to determine whether artisans may have used local flora and fauna, as well as imagery imported from European

religious and secular manuscripts, to replace the imagery from Asian lacquer they were imitating. Initial results from this visual investigation raised questions regarding the possible presence of unexpected colorants and the technique employed to decorate *barniz de Pasto* objects. A more thorough analysis of the gourd, with a special focus on the dyes, could provide precious information about biodiversity and act as a snapshot of indigenous influence in the arts by shedding light on the range of materials used and details of the technique.

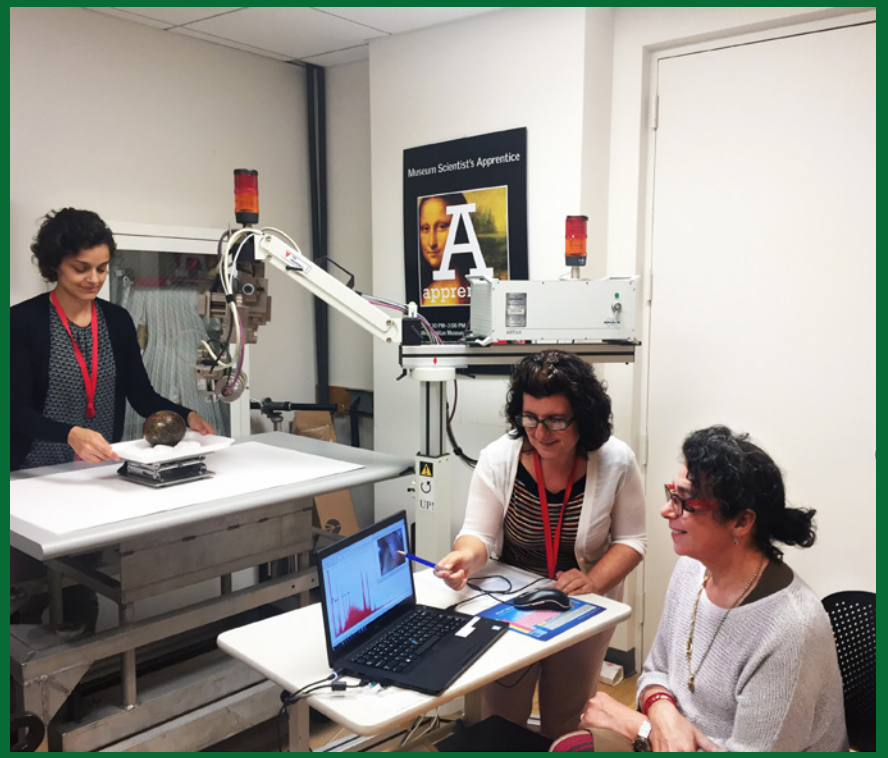
Initially, X-ray fluorescence analysis was used to determine the nature of the gourd's decoration materials, while fiber optics reflectance spectroscopy and multiband imaging provided preliminary data on the colorants. Then, microscopic samples were studied through an array of spectroscopic and chromatographic techniques: dyes and pigments were identified using Raman and surface-enhanced Raman spectroscopies, as well as high-performance liquid chromatography; a detailed characterization of the resin was offered by pyrolysis–gas chromatography/mass spectrometry; the metallic elements and, interestingly, the decoration's stratigraphy were investigated by scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy. Radiocarbon dating, conducted in collaboration with the University of Arizona, completes the technical information on the object.

The wealth of knowledge gleaned from this study has revealed details about the fascinating technique used on *barniz de Pasto* objects that demonstrate the extraordinary skill and craftsmanship of the artisans involved in the lacquer arts. It is no small wonder that a large number of these highly prized and beautiful artifacts made their way back to Europe, though as tastes changed, many came to languish in museum storerooms, misidentified as painted or made from other materials. It is our hope that the interest generated in this and future studies will prompt curators and collectors to take a closer look at their collections and, also thanks to scientific analysis, that such studies will give conservators the tools to preserve *barniz de Pasto* objects for future generations.



*Gourd Vase (Barniz de Pasto)*, Colombia, seventeenth century, The Hispanic Society Museum & Library (LS2400). Courtesy of The Hispanic Society of America, New York.

Micrographs of two details from
the gourd’s decoration.




NICS scientists Federica Pozzi and Elena Basso analyze the decorated gourd with Hispanic Society conservator Monica Katz by means of X-ray fluorescence spectroscopy.

# Color, Collation, and Curious Creatures: 15th-Century Block Books at The Morgan Library & Museum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## PRESENTING AUTHOR: REBA F. SNYDER

Reba Fishman Snyder is a 1986 graduate of the Conservation Program at New York University's Institute of Fine Arts and holds a master's degree in Art History from Columbia University. She has worked at a number of institutions, including The Museum of Modern Art and the New-York Historical Society, but has spent most of her career at The Morgan Library & Museum, where she has been a paper conservator since 1995. Snyder is actively involved with the study and treatment of old master drawings, prints, and manuscripts, and is particularly interested in artists' materials and techniques.




The Morgan Library & Museum owns the largest collection of block books in the western hemisphere. Most block books are full of naive but powerful medieval images of angels and monsters, saints and sinners, demons and biblical figures. Produced in Germany and the Netherlands between 1460 and 1490, these multipage books are rare examples of early printed books in which both image and text are made from a single carved woodblock (xylographica). Although created for only a few decades in the late fifteenth century, block books represent a production method that parallels the invention of typographic printing, which was introduced at the same time and quickly dominated the book market. Much bibliographic and codicological work has been done on this type of books in Germany, but little technical research on their materials has been performed to date, especially in the United States.

A preliminary visual examination of The Morgan's block books revealed that their printing inks vary in both color and opacity. While many of the volumes are printed in a single ink color, a few contain more than one. Several of the books' inks are brown, ranging from red-brown and green-brown to brown-black; others are gray and black in tone. Moreover, some printing inks are nearly translucent, while others are very dense. Because little is known about the composition of early printing inks, in-depth scientific analysis may provide useful information in this regard. In addition, some block books contain images characterized by just a single accent color, while others appear to have random areas or pages with multiple shades, and a few are extensively hand colored from beginning to end.

The present research project aimed to identify as many pigments and colorants as possible in a selection of block books from The Morgan Library & Museum and to characterize the variety of printing inks contained in them. While an exhibition has not yet been scheduled, curatorial interest in this topic is strong. A proposal for the digitization of all block books in North America is in development, based on a database assembled by Associate Curator of Printed Books John McQuillen. Technical information on the composition of the pigments, colorants, and inks will also be used to support research and updating of the bibliographic descriptions of The Morgan's block books, in order to create a more complete documentation of these objects.

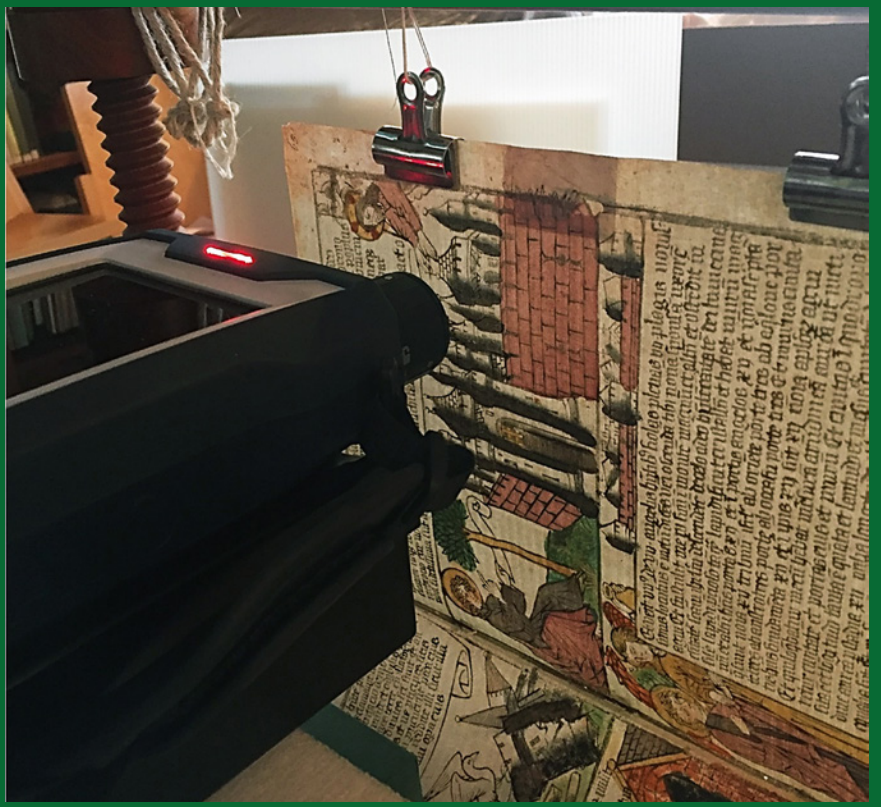
Initially, sixteen books were examined in the Thaw Conservation Center under magnification and using transmitted and raking light. Dozens of watermarks, useful in identifying the country of origin and rough dating, were detected with beta-radiography. Preliminary descriptions of the books were made based on visual examination of the printing inks and hand-applied colors. Various inconsistences in coloring were found, suggesting that some shades might be later additions. As a second step, approximately twenty-five pages in thirteen block books have been analyzed with noninvasive techniques, including X-ray fluorescence spectroscopy, fiber optics reflectance spectroscopy, and Raman spectroscopy. Interpretation of this data has revealed that both organic dyes and inorganic pigments, as well as mixtures of both, were used to color or accent the woodcuts. Selected inks and some colored areas that likely contained natural dyes were then sampled for further investigations of the printing inks and color palette using a benchtop Raman system equipped with a microscope, surface-enhanced Raman spectroscopy, and scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy.

The present contribution discusses findings of the ongoing research and scientific analysis of The Morgan Library & Museum's block books to date. This project has substantially increased the current knowledge of the inks, pigments, and colorants used in block books and securely links them to single-leaf woodcuts of the fifteenth century, as well as placing them in a medieval illumination tradition. In the near future, the work performed thus far may be expanded to include block books from other institutions in the NICS program.



*Apocalypsis Sancti Johannis*, PML8, folio 43v. The Morgan Library & Museum, New York.

NICS scientist Elena Basso conducts in-situ X-ray fluorescence analysis of one of the block books with Morgan Library & Museum conservator Reba Snyder.



In-situ Raman analysis of one of the block books in the collection of The Morgan Library & Museum.

Removal of microscopic samples from one of the block books in the collection of The Morgan Library & Museum for microinvasive analysis.

# A Miniature Diorama of a Kwakwaka'wakw Village: History, Analysis, and Conservation


## CONTRIBUTORS

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Judith Levinson, *Department of Conservation, Division of Anthropology, American Museum of Natural History*

Elena Basso, *Department of Scientific Research, The Metropolitan Museum of Art*

Federica Pozzi, *Department of Scientific Research, The Metropolitan Museum of Art*

## PRESENTING AUTHOR: LINDA LIN

Linda Lin holds a master's degree from UCLA/Getty Conservation Program, with a focus on ethnographic and archaeological materials. She has completed internships and fellowships on archeological sites in Greece and China and in museums across the U.S., including the Asian Art and De Young Museums in San Francisco, the Seattle Art Museum, and The Metropolitan Museum of Art in New York. From 2015 to 2017, she was the Conservator for Arts of Asia at the Newark Museum. Presently she is a project conservator at the American Museum of Natural History, working on monumental totem poles and miniature dioramas.




Exhibited in the Northwest Coast Hall at the American Museum of Natural History (AMNH) is a miniature diorama that is a conceptual representation of village life in a Kwakwaka'wakw village (M/135) on Vancouver Island, British Columbia, in the late nineteenth century. The architecture represented is a composite of elements from three Kwakwaka'wakw villages: Xwamdasbe' (Hope Island), H'kusam (Salmon River), and Tsaxis (Fort Rupert). AMNH curator Franz Boas, widely regarded as "the father of American anthropology," pioneered the use of models and life groups to attract the attention of visitors and to contextualize collection materials on display. Soon after joining AMNH in 1895, Boas supervised the construction of this miniature diorama (scale 1/2 in. to 1 ft.), made by William Orchard, a preparator in the Department of Anthropology. The Kwakwaka'wakw Village has been on continuous display in the Northwest Coast Hall, AMNH's first gallery entirely dedicated to the exhibition of cultural materials, since its opening in 1896. Because of its importance in the history of anthropological displays in U.S. museums, the Kwakwaka'wakw Village will remain a focal point in the Northwest Coast Hall, currently undergoing a major renovation that involves not only object treatment but also extensive collaboration with First Nations communities in the Pacific Northwest Coast.

The renovation project afforded a rare opportunity to study and conserve this beloved miniature diorama during the period it was removed from public view. The Kwakwaka'wakw Village model had been previously repaired and components added; however, no written records document the date of these interventions or identify added elements or the materials used. An investigation of the numerous materials in its construction was initially conducted using instrumentation available at AMNH, such as stereomicroscopy, polarized light microscopy, and Fourier-transform infrared (FTIR) spectroscopy. This initial foray into materials research identified the usual suspects in the fabrication of dioramas at the end of the nineteenth century, from houses constructed from painted wood and cardboard and canoes cast in plaster to miniature bushes made from plant materials dipped in colored wax. However, the most unusual material choice found was painted plasticine, which was used to form the human figures.

Plasticine, a synthetic modeling clay available after 1878, had not been previously reported in the manufacture of anthropological displays of this

type. Microscopic samples of the plasticine, as well as of the paint and surface degradation products were removed from the human figures and analyzed using X-ray diffraction, scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy, FTIR spectroscopy, and pyrolysis–gas chromatography/mass spectrometry at the Department of Scientific Research of The Metropolitan Museum of Art. Results from these scientific analyses shed light on the exact plasticine formulation and confirmed the identification of some of its degradation products in the form of sulfurous yellow crystalline efflorescence and soft brown extrusions consisting of Japan wax and a mixture of oils. Plasticine is an artist material not intended for permanent use. It presents numerous inherent vices, such as shrinking and deterioration, resulting in deformation and crumbling of weight-bearing areas. Furthermore, the painted surfaces overlaying the plasticine and in reaction with it exhibited extensive craquelure with dark staining.

This in-depth investigation of plasticine's material composition and degradation products unveiled some unique conservation challenges. The historic models and dioramas, originally intended for didactic purposes, have now become significant historical artifacts in the context of American museology. However, the longevity of materials used to construct these historic displays may not have been foremost in their makers' minds. This current project aims to call attention to plasticine's poor aging characteristics and its likely occurrence in dioramas across anthropological collections.



The miniature diorama of a Kwakwaka'wakw village in the American Museum of Natural History (AMNH M/135), before treatment

Ultraviolet-induced visible fluorescence image of human figures, showing extensive craquelure (left), uneven staining, and old adhesive repair (right) © AMNH.

AMNH conservator Linda Lin works on the Kwakwaka'wakw Village model © AMNH.

# Monitoring the Conservation Treatment of the *Samuel F. B. Morse* Memorial's Bronze Statue in Central Park


## CONTRIBUTORS

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Federica Pozzi, *Department of Scientific Research, The Metropolitan Museum of Art*

## PRESENTING AUTHOR: MATTHEW C. REILEY

Matthew Reiley, Manager of Conservation for the Central Park Conservancy, is responsible for the care of the Park's historic built environment. His work blends traditional techniques with the latest technologies to promote a sustainable regime of preservation for this cherished collection of monuments and features. Reiley is an adjunct faculty member of Columbia University, Graduate School of Architecture, Planning, and Preservation (GSAPP) and a Professional Associate of the American Institute for Conservation (AIC).




Beginning in the late 1970s, many of Central Park's bronze statues were coated with lacquer as a protective measure. Difficult and costly to remove, many of these coatings outlasted their performance life and were no longer adequately protecting the sculptures. In 2010 a cyclical campaign to remove and refurbish the coatings provided an opportunity to assess the condition of decoated surfaces, to develop suitable treatment approaches, and to consider context and sustainability through a contemporary lens. Originally installed on the Mall, the *Samuel F. B. Morse* memorial was moved to its current location near Fifth Avenue at East 72nd Street in 1988. When it was dedicated in 1871, the stately bronze figure of the nineteenth-century painter and inventor became the last monument in Central Park to honor a living person. Morse (1791–1872), a founder and the first president of the National Academy, is portrayed with his left hand resting on a single line telegraph machine. Created by sculptor Byron Pickett (b.?–1907), the statue was well received and a bust version was reproduced and offered for sale to the public.

Over time, the statue's surface has suffered from severe corrosive attack. Exposed areas are deeply pitted and sculptural detail has been lost: the effects of decades of unprotected exposure to atmospheric pollutants such as salts and acid rain. Blisters of active corrosion and associated localized coating failure have long been noted in the deep recesses of the figure's long coat, which prompted conservation staff at the Central Park Conservancy, in collaboration with NICS, to undertake a research project that aimed to investigate the issue and formulate an adequate treatment. In the first phase of the project, X-ray diffraction identified the corrosion species as consisting mainly of antlerite, atacamite, and clinoatacamite, all commonly associated with bronze disease, a slow, progressive condition that may affect the long-term stability of bronze objects. Moreover, pyrolysis–gas chromatography/mass spectrometry found that the organic coating was based on mineral wax and acrylics. These results informed a decision to remove the statue from its base and relocate it to a controlled workshop space to aid in the manipulation of the figure and optimize treatment.

The Morse figure's bronze disease and failing lacquer coating were removed with laser ablation, a process that uses specific laser parameters such as wavelength, pulse frequency and duration, and fluence to preferentially excite and safely remove unwanted coatings or contaminants from a surface

through photomechanical, photothermal, and photochemical reactions. During cleaning, three campaigns of X-ray fluorescence (XRF) noninvasive analysis were performed on eighteen selected locations to characterize the extent of corrosion across the sculpture's surface and monitor changes on the target areas. Following the initial phase of treatment, XRF showed the substantial removal of iron- and lead-rich compounds from the slightly brown-toned organic coating and atmospheric pollution deposition. After the second and third phases, variations in the relative amounts of chlorides and sulfates were noted. To evaluate the identity, distribution, and depth of corrosion products, a minute bronze sample was removed from the figure's rear coat for analysis with scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy. Results revealed the bronze's composition to be consistent with a copper-tin-zinc ternary alloy, while the corrosion showed a transition from cuprite to copper sulfates, to a very thin surface layer consisting of a mixture of copper sulfates and dirt.

The Conservancy's goal for conserved bronzes in Central Park's collection, with input and oversight of New York City's Design Commission, is to impart minimal net change from the sculpture's previous intended appearance. Apart from the bronze disease condition in the recesses of the figure's coat, complete removal of the corrosion layers was outside the scope of this project. Based on the findings of iron-containing pigments in the organic coating, a decision to apply a new coating containing such coloring materials was made as an aesthetic and a material benefit. The new light brown–toned lacquer applied over the slightly green underlying patina achieved the desired visual nuance for the finish, and the iron in the coating may provide cathodic protection of the bronze. Scientific analysis on the Morse statue has helped characterize current conditions on a microscopic scale and guide the means and methods of treatment; it has illuminated aspects of the sculpture's technical art history and relays essential information useful for future preservation.




Byron M. Pickett (b.?–1907), *Samuel F. B. Morse*, 1871. Courtesy of the Central Park Conservancy, New York.

Central Park conservator Matthew Reiley carries out laser cleaning on the *Samuel F. B. Morse* sculpture. Courtesy of the Central Park Conservancy, New York.



Comparison of the two halves of the statue's face before (left) and after (right) removal of the surface coating. Courtesy of the Central Park Conservancy, New York.

NICS scientists Federica Pozzi and Elena Basso analyze the *Samuel F. B. Morse* sculpture by means of X-ray fluorescence spectroscopy.

# Beyond the Connoisseurship Approach: Creating a Chronology in Hokusai Prints Using Noninvasive Techniques and Multivariate Data Analysis


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Marc Vermeulen is currently an Andrew W. Mellon postdoctoral fellow at Northwestern University–Art Institute of Chicago Center for the Scientific Studies in the Arts (NU-ACCESS). Prior to joining NU-ACCESS, Vermeulen was an Andrew W. Mellon fellow at The Met, where he worked on the study of Japanese woodblock prints from the Edo and Meiji periods. He also gained experience in various other museums and art research institutions in Europe and the U.S. Vermeulen's primary research interest is the identification of pigments and study of their degradation, mainly with spectroscopic techniques.




*Thirty-Six Views of Mount Fuji*, created between 1830 and 1832, is a series of landscape prints by the Japanese *ukiyo*-e artist Katsushika Hokusai (1760–1849). This print series, to which the iconic *Under the Wave off Kanagawa* belongs, is arguably one of the most well-known and successful sets of Japanese woodblock prints ever produced. Despite its name, the series actually consists of forty-six prints, ten of which are later additions to the original body. Because of the ease offered by the woodblock printing technique, hundreds of copies of these prints could be quickly produced and sold cheaply. Today, Japanese woodblock prints can be found in the holdings of many cultural institutions, including The Metropolitan Museum of Art, the Brooklyn Museum, the New York Public Library, The Victoria and Albert Museum, and the Royal Museums of Art and History. While prints are also located in several other museums, the collections mentioned above are the ones on which this study focuses.

Despite having been created at a time when Japanese trade was heavily restricted, Hokusai's prints display the influence of European art in both their composition (especially the use of perspective and low horizon line) and coloring materials. While indigo and dayflower blue have been Japan's main natural sources of blue colors, Japanese artists, including Hokusai and Hiroshige, also had access to Prussian blue, a modern synthetic blue pigment available in Japan from the 1820s. The artists' enthusiasm for this new pigment is clearly illustrated by the increasing popularity of *aizuri-e* prints, created entirely or predominantly with shades of blue.

Initial analysis of *Under the Wave off Kanagawa*, also commonly known as *The Great Wave*, by means of fiber optics reflectance spectroscopy (FORS) and Raman spectroscopy highlighted the simultaneous presence of Prussian blue and indigo in the darkest shades of blue as well as in the outlines and cartouche. The prints referred to as the "early" prints—the ones produced early in the printing process and whose lines are, therefore, sharper—were all characterized by a unique FORS spectroscopic signature compared to similar prints considered to be later impressions. This result has been attributed to differences in the relative amounts of Prussian blue and indigo in the mixture used for the keyblock or outlines. Following this observation, a wider systematic study of the blue colors used in the prints and especially in the outlines of the *Thirty-Six Views of Mount Fuji* print series was undertaken.

Pigments and colorants in the prints were investigated and identified with noninvasive techniques, including FORS and Raman spectroscopy. While the initial aim was to understand which prints from the series had the same spectroscopic signature as the "early" *Great Waves*, it quickly became clear that the variations in the Prussian blue/indigo mixtures could be used to create groupings of prints and to attempt to generate a production chronology within the series.

Tracing the chronology of woodblock printing is difficult because prints were only created until fashion changed or interest faded. While line quality and wear in the keyblock can offer important indications on the relative chronology of production of impressions in the same print, this approach—commonly called "the connoisseurship approach"—is rather time-consuming and only allows scholars to compare prints with the same design. The present research aimed to build a chronology of the print production for the *Thirty-Six Views of Mount Fuji* series from various collections by combining the connoisseurship approach with scientific investigations. Consequently, chemometrics (mathematical and statistical methods) was applied to the large FORS spectroscopic dataset obtained for the Prussian blue/indigo found in the outlines of the 180 prints studied. This enabled the authors to create groups based on small spectroscopic differences, which corresponded to various Prussian blue/indigo compositions. Because it is implausible that two prints printed at the same time would have different materials composition, each group likely corresponded to a different printing set. The connoisseurship approach was then applied to identical designs found in different groups, making it possible to place in time not only several prints with a single design but also the entire group to which such prints belong. This combined methodology proved crucial to gain a better understanding of the overall production history of an iconic print series such as the *Thirty-Six Views of Mount Fuji*.



Katsushika Hokusai (Japanese, 1760–1849). *South Wind, Clear Sky (Gaifū kaisei)*, also known as *Red Fuji*, from the series *Thirty-Six Views of Mount Fuji (Fugaku sanjūrokkei)*, ca. 1830–32. 10 x 14 7/8 in. (25.4 x 37.8 cm). The Metropolitan Museum of Art, New York, Henry L. Phillips Collection, Bequest of Henry L. Phillips, 1939 (JP2960).

Former Met fellow Marc Vermeulen examines a Japanese woodblock print under the stereomicroscope.


A print from the *Thirty-Six Views of Mount Fuji* series is analyzed noninvasively by Raman spectroscopy.

One of Hokusai's *The Great Wave* copies is analyzed noninvasively by fiber optics reflectance spectroscopy.

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