

The Institute for the Preservation of Cultural Heritage



A Research Enterprise at Yale's West Campus



Assistant paintings conservator Jessica David studies the inscription on a panel painting to confirm that the date (1567) is original to the artwork. Unknown artist, 16th century, British. *Portrait of a Woman*, 1567. Oil on panel. Yale Center for British Art, Paul Mellon Collection.

Advancing cultural heritage preservation at Yale and around the world

Our understanding of the Ancient Egyptian language comes from a bit of broken stone a French lieutenant stumbled upon during a Napoleonic campaign. Generations of scholarship in literature and linguistics branch from the single intact manuscript of *Beowulf*, which was nearly destroyed in an eighteenth-century fire. It is impossible to say what knowledge could have emerged from the city of Antioch, had it survived a massive earthquake in 526 A.D., or from the estimated 43 percent of Polish cultural heritage that was destroyed during World War II.

Our perception of ourselves and our preparedness for the future depend on the art, artifacts, architecture, and now digital records that comprise our shared cultural heritage. Such objects are a source of fascination for scholars and the public, including the millions who visit 55,000 museums and cultural sites in more than 200 countries each year. From the Machu Picchu ruins to China's terra-cotta warriors, these treasures form an important, often fragile record of the human experience.

In 2011, with a landmark gift from Lisbet Rausing and Peter Baldwin '78, Yale University established the Institute for the Preservation of Cultural Heritage (IPCH) to serve as an international hub for the study and conservation of the world's shared treasures. Located on Yale's West Campus, the institute will address challenges – within Yale's holdings and collections across the globe – that are of common concern for scholars and practitioners in the conservation community worldwide.

As a global university, Yale is committed to promoting the widest access to its collections, research findings, and best practices. Donors can help the university by supporting the IPCH in this mission, ensuring the resources needed to study and protect cultural treasures, advance the science of preservation, and educate scholars and practitioners who work around the world.



A resource for the global conservation community

The preservation and advancement of knowledge have been fundamental to Yale's work since the founding gift of books and artwork that led to its establishment in 1701. Today, its expansive holdings require the university to be a world leader in conservation and preservation – a vital mission at a time when so many treasures are at risk from degradation, climate change, conflict, and rapid societal change. Equally important, Yale's faculty, staff, and students are finding new ways to study these artifacts, yielding fresh insights about a wide range of objects and the societies that produced them.

The Institute for the Preservation of Cultural Heritage leverages the University's intellectual and material resources in a multidisciplinary

program that combines research and collections management with teaching and outreach.

The institute draws on the skills and resources of the Yale University Library, the Peabody Museum of Natural History, the Yale University Art Gallery, and the Yale Center for British Art. Key partners also include the Center for Conservation and Preservation (CCAP) and the Yale Digital Collections Center (YDC2), whose laboratories opened in April 2013 as part of the West Campus complex.

Faculty members from across Yale's schools and departments will collaborate in IPCH research, often involving undergraduates as well as graduate students and post-doctoral



fellows. Indeed, the participation of students is an important advantage for IPCH, one of the few institutes of its kind located within a research university.

The institute's fundamental mission is to share its findings and best practices with conservation scientists worldwide. To promote broad collaboration and exchange, the institute will sustain a cohort of visiting scholars and fellows — professors, conservators, creators, artists, students, information technologists, and curators — who will engage in original research as well as translation and dissemination of their findings. The institute will also train current and future conservators at Yale and abroad, through seminars, workshops, and online courses.

From left to right: *Astrolabe*, German, 1537. Peabody Museum of Natural History.

Female Ancestral Mask (Zoba). Vai, Liberia, late nineteenth century. Wood, metal, and coins. Yale University Art Gallery, gift of Charles D. Miller III '74.

Detail from Joseph Mallord William Turner, *Dort or Dordrecht: The Dort Packet-Boat from Rotterdam Becalmed*, 1818. Oil on canvas. Yale Center for British Art, Paul Mellon Collection.

The Gutenberg Bible, c. 1454. Beinecke Rare Book & Manuscript Library.

A hub for cutting-edge, interdisciplinary work

The IPCH is dedicated to expanding what is known about cultural treasures and improving our ability to preserve them. This important work is anchored by Yale's own collections and amplified by the innovative ideas, research, and teaching interests of Yale's faculty.

For example, Yale University Art Gallery conservators, working with research scientists at CCAP, are investigating how to characterize the materials and techniques used to make the four Roman painted wooden shields in the Gallery's collection, which date from the mid-third century. Examples of painted wood from this period are extremely rare, and many of the shields' paint layers, although deteriorated and fragile, survive. When excavated, the shields were stabilized with a synthetic adhesive on site, which now interferes with accurate analysis of the original organic materials used in their creation. Scientists at CCAP and the West Campus Analytical Core are refining a technique they hope can "see through" the adhesive to detect and identify the original materials.

The Roman shields present a rare opportunity to compare an actual painted artifact with contemporary written sources on painting techniques in ancient times. Conservators believe they may also find a previously unrecognized relation to later documented techniques of early medieval panel painting in Western Europe. Further research and collaboration are needed with conservators and curators caring for the few related objects that survive from this period—now in collections

in France and Germany—both to add to our knowledge and to devise the most appropriate conservation treatment.

The institute's West Campus location greatly enhances opportunities for such cross-disciplinary work. Housed within the Collection Studies Center, with its 212,000 square feet of laboratories and browseable storage, IPCH has generous room for conservation of Yale's collections, along with ample teaching and work space for visiting fellows and professionals.

The IPCH's proximity to Yale's scientific research institutes secures access to expertise and equipment for advanced imaging and analytical chemistry as well as facilities for high-performance computing, data transmission, and storage. Equally important, the West Campus's executive conference center—spacious, modern, and fully equipped—offers a superlative venue for training programs and conferences.

Opposite: Scientist Anikó Bezur and conservator Ian McClure study the paint on a Roman shield, which was excavated at Dura-Europos in the 1930s.

Right: Yale conservators will compare techniques used to paint the third-century shield with methods used to create works like this mid-thirteenth-century panel (detail) from the Gallery's collection of early Italian panel paintings. Circle of Bonaventura Berlinghieri, 1228–1274. *Lamentation over the Dead Christ*, c. 1230. Tempera on panel. Yale University Art Gallery.





Leveraging Yale's World-Class Collections

Few academic institutions in the world have collections matching the depth and breadth of those within Yale's museums and libraries. The holdings of the Peabody Museum of Natural History alone encompass nearly thirteen million specimens and objects in ten curatorial divisions, from anthropology to vertebrate zoology. The Yale University Art Gallery and the Yale Center for British Art hold exemplary collections from antiquity to the present. The university also boasts the world's seventh-largest library system, with over thirteen million volumes and countless original manuscripts and documents in twenty-one libraries, including Sterling Memorial Library and the Beinecke Rare Book & Manuscript Library.

The IPCH is unique in its ability to draw from the university's broad resources to study cultural materials of nearly every type – papyrus, parchment, paper, paintings, photographs, maps, sculpture, books, minerals, rocks, plants, zoological specimens, ethnographic materials, furniture, decorative arts, and electronic media. The institute serves as a hub for the preservation and conservation of these diverse holdings and more importantly as a vital research center exploring how various objects should be conserved, stored, and contextually understood. Questions that arise from dealing with Yale's collections will drive new discoveries, helping shape and inform the conservation of objects worldwide.

L. Rigaud.

A case study: the portraits of Louis Rigaud



In summer 2011, Mark Aronson, chief conservator of paintings at the Yale Center for British Art, traveled to Haiti with a team from the Smithsonian Institution to repair artworks damaged in the 2010 earthquake. Soon after returning to Yale, he visited a new storage facility at West Campus for his first look at a collection of Haitian paintings long held by the Peabody Museum of Natural History.

The fifteen paintings, attributed to Haitian artist Louis Rigaud, date from the 1870s and '80s and depict Haitian leaders, including François-Dominique Toussaint Louverture, the leader of the Haitian Revolution and the country's first president. Aronson noted that the portraits needed extensive conservation – surfaces were dirty, varnish was discolored, paint was flaking, and canvases were torn. It was a perfect opportunity to reconnect with the Haitian conservators he met abroad.

In the summer of 2012, Aronson played host to Franck Louissaint and Jean Ménard Derenoncourt, professors at the École Nationale des Arts in Port-au-Prince, who spent four weeks on campus studying and treating the paintings. They observed Yale's conservators at work and gave talks on their own art-making processes as well as their preservation experiences in Haiti. During this time, assistant conservator of paintings Jessica David completely restored the portrait of Toussaint Louverture, which is now on display at the Yale University Art Gallery.

Today, Yale's Center for Conservation and Preservation is conducting a technical study of the paintings, using scanning electron microscopy and energy dispersive x-ray spectroscopy to identify the materials used by Rigaud. The study also explores whether the artist used photographic techniques to compose his portraits before he applied paint.

This work has drawn the interest of Erica James, assistant professor in the history of art and African American studies at Yale, who notes that it is rare to find such rich examples of African diaspora art – especially a collection from Haiti. James now studies the portraits for clues about the evolution of European visual culture in the postcolonial world; in summer 2013, Catherine Colford CC '16, an Art Museum Scholar Summer Intern, helped her trace the portraits' visual roots.

Moving forward, Yale plans to fully conserve all fifteen paintings – a process that will engage more Haitian conservators. As the IPCH expands its efforts, it might host a symposium and workshop around sustainability practices in developing nations, perhaps addressing preservation practices in areas with few resources, or the challenges of working in humid climates. Aronson hopes that the paintings will be featured in an exhibition – a finishing touch on a multifaceted project that has brought together a new scholarly peer group and expanded our knowledge of Haiti's art history.



Leaders in preservation, conservation, and discovery



Conservator Irma Passeri uses a Bruker Tracer III-V handheld x-ray fluorescence spectrometer to examine a painting. The instrument allows for non-destructive characterization of the pigments. Piero di Cosimo, *Virgin and Child with Saints Vincent Ferrer and Jerome*, c. 1510–1515. Oil on panel. Yale University Art Gallery.



A laser probes the contours of a bust of Alexander Pope.

A closer look at art

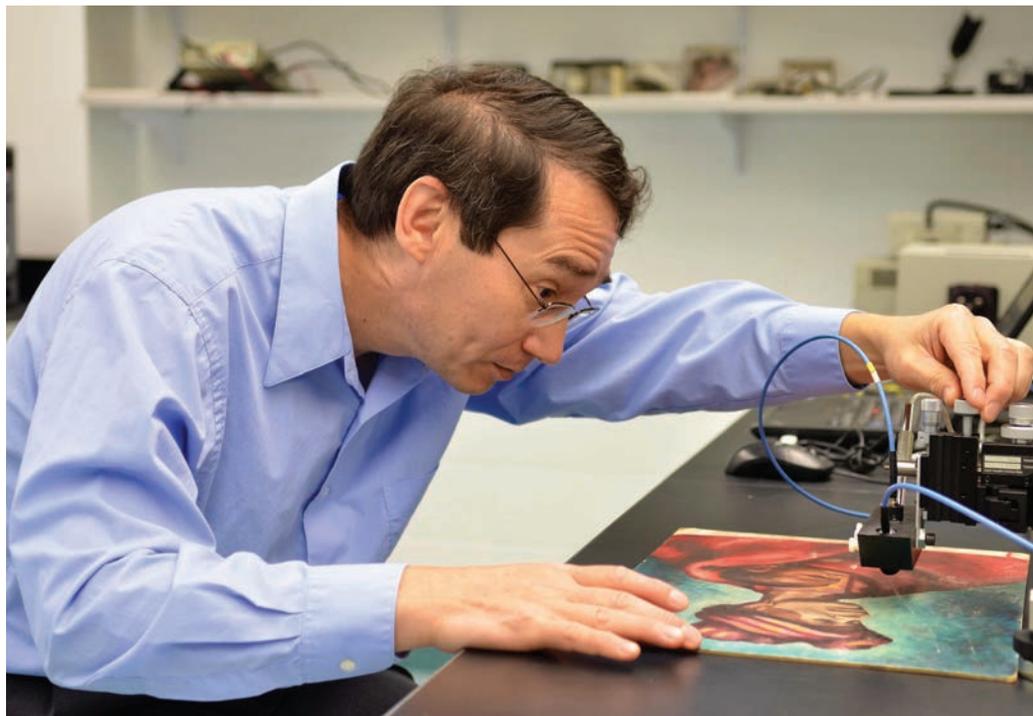
A computational scientist who works at the crossroads of art and science, Holly Rushmeier is blazing new trails for scholars who interpret artworks, artifacts, and historical sites. With a focus on cultural heritage computing, her work combines three-dimensional scanning and multi-spectral imaging with powerful visualization technologies and interactive tools that give researchers unprecedented means to examine, annotate, and analyze objects, often in a collaborative setting. The resulting studies become part of the permanent object record. In one project, Rushmeier

is working with Anne Gunnison, an object conservator with the Yale Center for British Art and the Yale University Art Gallery. Together, Rushmeier and Gunnison will study busts of Alexander Pope held in collections at the Yale Center for British Art and in the United Kingdom. Using high-resolution, three-dimensional scans, they plan to precisely image the surfaces of the sculptures to record their current state of preservation, find evidence of past treatments, and further explore how artists like Louis-François Roubiliac produced sculptures in the eighteenth century.

Predicting a pigment's life span

Watercolors are notoriously prone to fade when exposed to light, and as a rule, museums are very cautious

when deciding how long a watercolor painting can be exhibited. Paul Whitmore, a conservation scientist at CCAP, is bringing a new precision to these decisions with the micro-fading tester (MFT), an instrument he invented to predict how pigments change with exposure to light. In recent years, he has tested works that include paintings by Winslow Homer, a collection of American miniatures, and Heather Hurst's meticulous reproductions of the Bonampak murals, currently on display at Yale University Art Gallery. In many cases, Whitmore's data has provided curators with the confidence to exhibit paintings for longer periods of time—an outcome that makes these precious artworks more accessible to the public.



Paul Whitmore tests the stability of pigments used to paint a portrait.

Botanicals meet technology

A professor of ecology and evolutionary biology, Michael Donoghue studies the evolutionary history of plants. As curator of the Peabody Museum's expansive botany division, he is also a longstanding champion of Yale's efforts to digitize its massive array of plant specimens. Along with collections manager Patrick Sweeney, Donoghue has overseen the imaging and cataloging of over 50,000 Connecticut vascular plant specimens, and efforts continue. With support from the National Science Foundation and the Andrew W. Mellon Foundation, the team uses a high-throughput method for imaging botanical specimens stored as pressed samples on large paper sheets, which will lead to digitization on an even larger scale. The information is available to scholars and the public through the Peabody's data-sharing portal.

Tracing art by its pigments

The work of neoclassical painter Johan Joseph Zoffany offers a window into the global impacts of art during an age of empire building. Born in Germany in the eighteenth century, Zoffany was trained in Italy, painted portraits for the British court, and created some significant works while traveling in India, including a portrait now held by the Yale Center for British Art. Jessica David, assistant paintings conservator, is working with cCAP to determine if a yellow pigment in the portrait is one traditionally used

by Indian artists; the implication is that Zoffany and other British artists may have learned of this pigment during their time in India and then brought it back to artists practicing in Britain.

David is also using x-ray fluorescence spectroscopy to discover more about the painting materials used in the production of Tudor and Jacobean portraits.

A novel analysis of poetry

English professor David Scott Kastan explores the relations of literature and history in early modern England, particularly the production, transmission, and reception of texts.

To this end, he is using top-end imaging technologies to compare two fragments of early seventeenth-century poetry, printed in non-sequential, eight-page signatures held by the Beinecke Rare Book & Manuscript Library. Kastan will analyze both the paper supports and inks to determine whether the two sets of pages came from the same print shop—or perhaps even the same, previously unknown book.

The art and craft of book binding

Led by chief conservator Christine McCarthy, conservators and curators in the Yale University Library have developed the Traveling Scriptorium, a teaching kit that supports the study

of medieval and early modern books. Available to undergraduate and graduate classes at Yale, the kit contains samples of the materials and components used to make books found in the Beinecke—including wood, leather, skins, parchment, vellum, pigments, and inks—as well as the tools and methods that dominated book binding from the eighth to the seventeenth centuries.

The project also supports an active blog with detailed articles, illustrations, and links to scholarly resources, allowing virtual access to the Traveling Scriptorium for teaching faculty, conservators, and curators around the world.

New life for an ancient treasure

Procopius Church was a jewel of sixth-century Gerasa, a Greco-Roman city that underlies modern-day Jordan. In the 1920s, its ornate floor mosaic was excavated by a joint expedition of Yale and the British School of Archaeology in Jerusalem. A few years later, the mosaic was reinforced with concrete, which has since cracked.

Now, Carol Snow is using a process developed at IPCH to separate the delicate artwork from the concrete backing, replacing it with new composite panels. In 2014, the artwork will join another Gerasa mosaic already on display at the Yale University Art Gallery.



Carol Snow, deputy chief conservator and the Alan J. Dworsky Senior Conservator of Objects at Yale University Art Gallery, supervises the conservation of a floor mosaic from Procopus Church, once a prominent building in sixth-century Gerasa.

The Center for Conservation and Preservation

During World War I and its relentless bombings, the staff of the British Museum boxed up prized artifacts, including the Rosetta Stone, and stored them in deep basements and subway tunnels. Opening the crates in 1918, curators were dismayed to find that many objects had deteriorated. Soon after, the museum hired chemist Alexander Scott, who set up a laboratory to investigate why the conditions had accelerated



Ian McClure, director of CCAP

degradation—thus launching the field of conservation science.

The experts at Yale's Center for Conservation and Preservation agree that science offers the best defense against the degradation of valuable resources. Under the direction of Ian McClure, the Susan Morse Hilles Chief Conservator of the Yale University Art Gallery, CCAP is pioneering the conservation of all Yale collections, working with materials from parchment to natural history specimens and from furniture to photographs.

CCAP gained further momentum in 2013 when the Conservation Research Center, formerly at Carnegie Mellon University, moved to Yale and merged into its operations, adding three conservation scientists to CCAP's growing team. Already at work on a spectrum of important projects, CCAP will in coming years serve as a worldwide source of expertise and information.

At the crossroads of art and science

While a bomb, flood, or fire can destroy in an instant, the vast majority of cultural treasures are subject to a less precipitous but equally lethal villain: time. Degradation that happens slowly and sub-microscopically can be tremendously challenging to understand, much less slow or reverse.

CCAP responds to the needs of collections experts across campus—including those from IPCH, the Yale University Art Gallery, the Yale Center for British Art, the Yale University Library, and the Peabody Museum of Natural History. For example, Anikó Bezur, CCAP's director of scientific research, is apply-

ing gas chromatography with mass spectrometry to learn about materials used in Tudor portraits held by the Yale Center for British Art. Another project successfully identified residues on the surface of Velázquez's *Education of the Virgin*, a prized Art Gallery holding; further examination and analysis of the materials and techniques of painting will shed light on the artist's early career in Seville. And a foremost expert in Van Gogh's painting techniques has asked for CCAP's help in identifying certain pigments the artist used – information she will use in a teaching lecture.

The modern treatment and research laboratories housed within CCAP's 15,000-square-foot facility are equipped to support both chemical and microscopic analyses, including x-ray fluorescence spectrometry, which can identify the elements that compose a sample. In many cases, researchers will develop new techniques to gather data previously beyond the research of conservators. This complex work has a dual purpose: to learn more about when and how objects were made, and to better understand how materials degrade. Based in science, these insights can be applied to research and preservation.

A guiding principle at CCAP is that work done on individual objects should also help advance conservation science worldwide. Yale is committed to a culture of collaboration and already disseminates information about collections and treatments. In coming years, CCAP will expand this practice through workshops, conferences, digital platforms, and publications.



Anikó Bezur, the Wallace S. Wilson Director of Scientific Research at CCAP



YDC2 director Meg Bellinger

The Yale Digital Collections Center

Working with medieval manuscripts presents particular challenges: they are very fragile and so rare that scholars often travel thousands of miles to see them. When the manuscripts are viewed, it is in highly controlled settings, so that teaching from a manuscript or collaborative research becomes prohibitively difficult.

The pioneering work now under way at the Yale Digital Collections Center, directed by Meg Bellinger, will help remove these barriers. In one project, researchers are applying digital tools to study manuscripts of Chaucer's *Canterbury Tales* held by the Huntington Library in San Marino and the National Library of Wales and

seen side-by-side for the first time. Advanced imaging techniques enable rapid and accurate color characterization of inks and pigments, and new computational tools allow the researchers to compare these materials with other manuscripts held in collections at Yale and abroad. Notably, this project is creating the highest concentration of high-resolution digital representations of the manuscripts, including multi-spectral images. Tools have been developed by post-doctoral fellows to apply pattern recognition to thousands of pages of images, giving humanities researchers powerful computational means to understand medieval manuscripts.

This corpus can be broadly disseminated to laboratories and classrooms around the world to provide the basis for future discovery through cultural heritage computing. Such efforts help scholars share information with their peers, even as they expand what we know about the manuscripts themselves.

Computational tools can be similarly applied to holdings across the university's museums and libraries. At the Peabody Museum, curators use YDC2's robotic scanners to digitize ledgers, field notebooks, specimen labels, and other related materials that can be mined for new information about biodiversity and climate change. And at the Yale University Art Gallery, which holds materials excavated in the 1920s from the city of Dura-Europos in Syria, curators are collaborating with international partners in a three-dimensional recreation of the archeological site, integrating new findings with extensive documentary evidence in Yale's libraries and elsewhere. This extraordinary application of computer technology will dramatically advance scholarly research and interaction.

In 2011, Yale instituted a groundbreaking open-access policy that makes high-quality digital images of its vast cultural heritage collections openly and freely available to scholars and the public. YDC2 ensures that digital information about these collections is created,

managed, preserved, and broadly accessible to anyone exploring questions about our heritage.

Breaking new paths in digital capture, sharing, and computation

YDC2 is a center of expertise in digital content management that provides comprehensive digitization, curation, and media-storage facilities, designed to reinvent the way scholars capture, catalog, annotate, interpret, and disseminate information from the world's cultural-heritage collections. In the YDC2 laboratory, specialists can photograph oversized artworks from a suspended catwalk, place others on a jumbo-sized, adjustable easel, or capture three-dimensional objects in front of an "infinity wall" under color-corrected lighting. Studios house robotic book scanners, three-dimensional scanners, multi-spectral imaging cameras, and equipment for reflectance transformation imaging, a computational photographic method that captures a subject's shape and color and enables the interactive "re-lighting" of the subject from any direction.

Digitizing collections in such exacting detail serves many purposes. Imaging techniques, computational analysis tools, and digital platforms allow researchers to analyze, document, study, and share collections in ways never before possible, adding to our fundamental knowledge of art and artifacts. Putting more images and data out on the Web enables the layering and

exploration of multiple meanings, contexts, and relationships among objects that can be achieved by linking together sources of knowledge to create new relationship mappings or networks.

It also facilitates discourse within the global scholarly community: Since a digital file can be shared with the click of a button and archives searched with a well-chosen keyword, scholars and conservators anywhere can access collections for teaching, share their thoughts and findings through annotations, and consult an object record even as they work on preservation in situ.

Digital data are as vulnerable to natural and man-made disasters as the cultural heritage objects themselves, but properly preserved, they provide an important source of memory about those very objects. This work would be impossible without the YDC2's ground-breaking efforts in the preservation of data itself, a continuing challenge in an era when technology quickly becomes obsolete. By using advanced methods and digital tools that distribute information across servers and the Web, YDC2 aspires to make all Yale's cultural heritage data accessible broadly and permanently – to have all collected images and research findings live indelibly as part of an object record. This will ensure that the global community has information about objects not just in time but over time, and help fully realize the promise of the Web to democratize access and deepen knowledge.



To learn more

For more information about Yale's West Campus, please visit:
www.yale.edu/westcampus

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Harold Shapiro: Page 3 (right)



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