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On West Campus, researchers preserve ‘materials and meaning’ of art objects

By Mike Cummings

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A team from the Yale University Art Gallery and the Institute for the Preservation of Cultural Heritage is conserving an array of works by American artist Edwin Austin Abbey for an upcoming exhibition. The circular painting in the background, a 12-foot diameter study for Abbey's "The Hours"— a mural that adorns the rotunda of the Pennsylvania State Capitol — was unrolled and stretched onto an aluminum frame for treatment in IPCH's Conservation Lab. (Photo credit: Stephanie Anastasia)

As works of art age, their component materials can change in ways that signal maturity, history, and authenticity, said Paul Whitmore, a research scientist at the Institute for the Preservation of Cultural Heritage (IPCH) at Yale's West Campus.

But eventually, the signs of old age can become distracting or disruptive as materials degrade — colors fade, paint becomes brittle, and wood warps, he said.

"More than just the bloom of youth is being lost, the original expression of the creator is becoming obscured or distorted," said Whitmore, who directs IPCH's Aging Diagnostics Lab, while speaking at "Materials and Meaning: Decoding and Preserving Cultural Heritage," a conference held on Feb. 22 at West Campus.

Preserving the meaning of cultural-heritage objects requires intensive study of their materiality, he said.

"To answer these questions about an object's passage through time, we need a deep understanding of the component materials — not just what they are, but what they are prone to do, especially under external influences, such as storage and use," he said.

IPCH, established in 2013, is "dedicated to the preservation and interpretation of material culture through collaborative research, practice, training, and outreach," according to its mission statement.

"I hope this day will illustrate how we try to put the saying into practice," said IPCH Acting Director Ian McClure, the Susan Morse Hilles Chief Conservator at the Yale University Art Gallery (YUAG), at the start of the daylong conference.

The program gathered conservators, curators, art historians, and scientists of various stripes from across Yale and partnering institutions to present more than a dozen ongoing projects that utilize a diverse range of scientific and scholarly approaches. These collaborations demonstrate the breadth and depth of Yale's collections. They involve objects as varied as mammal taxidermy displays, parchment manuscripts, ancient sculptures, early photographs, and 20th-century paintings.

Treatment and restoration

Julia Sybalsky, senior associate conservator at the American Museum of Natural History in New York City, described a project the museum launched with IPCH's Aging and Diagnostics Lab, the Yale Peabody Museum of Natural History, and the Institute of Museum and Library Services to test the use of Orasol® dyes to recolor badly faded taxidermy displays.

They tested the dyes' light-fastness — its resistance to fading when exposed to light — and their impact on the rate of degradation of a specimen's fur as it remained on display. Both lines of inquiry required the accelerated aging of dyed samples followed by chemical analysis to gauge the effects of aging.

"We found that the dyes did not increase the rate of deterioration and, in fact, may offer some type of protective benefit by shielding the fibers from light," she said, adding that the light-fastness tests showed the dyes have an acceptable level of durability. "This treatment represents a much better option that anything that was done before."

The research was put into practice during a recent restoration of the Peabody Museum's North American dioramas.

In preparation for an upcoming exhibition, the Yale University Art Gallery (YUAG) and IPCH are collaborating on a close study of YUAG's extensive collection of the work of Edwin Austin Abbey, a muralist, easel painter, illustrator, and prominent figure in the American Renaissance of the late 19th and early 20th centuries.

Genevieve Antoine, a postgraduate associate at IPCH, presents her research comparing image-processing techniques to evaluate a method for cleaning acrylic paint surfaces. (Photo credit: Stephanie Anastasia)

Kelsey Wingel, a postgraduate associate at YUAG, and Richard Hark, assistant conservation scientist at IPCH, discussed one facet of this wide-ranging study — the treatment of a study Abbey made for his mural "The Spirit of Light," which also decorates the Pennsylvania State Capitol. The study, which is oil paint on canvas, had become coated in a white haze called efflorescence. (A similar haze can form on a bar of chocolate that is improperly stored.)

"We have 600 paintings in the collection by Abbey and 300 of them have this white haze, which really obscures the paint layers and much of his brushwork," Wingel said.

Hark and his IPCH colleagues analyzed a tiny sample of the painting — smaller than a pinhead — that showed the presence of zinc, which was unexpected, he said.

A cross-sectional sample of the painting provided a clue: A layer of the painting contained a large amount of zinc. The scientists determined that zinc ions were binding with fatty acids in the oil paint to form zinc soaps — pustules that could rise to the surface of the painting, Wingel explained.

Further testing identified the chemical components of the zinc soaps, which informed the painting's treatment, she said.

Wingel tested a range of solvents before finding one that would remove efflorescence without degrading the layer of paint beneath it.

“It is chemistry borrowed from the cosmetics industry,” she said. “It’s just beginning to be adapted to the field of conservation.”

Why the solvent works is a mystery, Wingel noted.

“This is a really ripe area for scientific research and it’s something that we hope to pursue in partnership with IPCH,” she said. “We all recognize it has great potential to not only further clean Abbey’s paintings but also to contribute new and useful information to the conservation field.”

Decoding objects

In addition to aiding preservation, research coordinated through IPCH uncovers information about the people who created, used, and cared for cultural heritage objects, said Anikó Bezur, the Wallace S. Wilson Director of Scientific Research at IPCH.

“Knowledge about how things were made and how they have changed due to human intervention and degradation can lead to great insight about technology, trade, values, belief, etc.,” said Bezur, who directs the Technical Studies Lab at IPCH.

IPCH is working with conservators at the Yale University Library to try to unlock secrets of the Vinland Map, which purports to be a 15th-century world map with a pre-Columbian depiction of “Vinland,” a section of North America’s coastline southwest of Greenland. The map, which is housed at the Beinecke Rare Book and Manuscript Library, is widely considered a 20th-century forgery.

Pablo Londero, a conservation scientist at IPCH, described analysis being performed on the map’s inks as well as those of the two medieval volumes with which the map was bound: part of Vincent de Beauvais’s encyclopedia, “*Speculum historiale*,” and the “Tartar Relation,” an account of a 13th-century journey by two monks into the lands of Genghis Kahn. The analysis showed the presence of two inks in the “Tartar Relation”: one with a chemical composition consistent with iron gall inks used by 15th-century scribes and a second corrective ink containing titanium dioxide, which is often present in modern commercial ink, Londero said.

The map’s ink has a similar chemical makeup as the corrective ink in the “Tartar Relation,” Londero said. The research is ongoing and the findings are not definitive, but the presence of titanium dioxide in the map’s ink appears more consistent with 20th-century materials, he said.

“There’s ongoing work to feel more certain about this, but it does raise some questions as to the date when the map was made,” Londero said.

Jessica David, senior conservator of paintings at the Yale Center of British Art (YCBA) discussed a project she was been working on with Ed Town, YCBA’s head of collections information and access and assistant curator for early modern art, to better understand a collection of Tudor and Jacobean portraits that lacks extensive documentation and for which the identities of the artists and subjects are often unknown.

IPCH provided David and Town a grant to examine paintings held at other institutions and in private collections that appear related to those in the YCBA’s collection for clues to help them identify artists and sitters. Their sleuthing requires a close study as characteristics such as the styles of brushwork can help to identify an artist.

Jessica David and Ed Town of the Yale Center for British Art discuss their efforts to gather information about a collection of Tudor and Jacobean portraits. (Photo credit: Stephanie Anastasia)

“We employ close-looking documentation and comparison as a means to establish relationships between paintings and painters,” David said. “And since we typically cannot bring objects together physically, our conclusions are drawn back at Yale with the material we collected.”

From materials to digital

Paul Messier, the Pritzker Director of the Lens Media Lab at IPCH, noted that the rise of digital technology has triggered a rapidly unfolding transition from a visual culture dependent on materials to one where the use of materials is optional.

The research performed at IPCH on the materiality of Yale's collections — and the datasets that work yields — will help students who have grown up in a visual culture based on digital information to appreciate and understand material culture and pull meaning from materials, Messier said.

"I think the university and IPCH are uniquely situated to understand this transition," Messier said.

Damon Crockett, a data scientist at the Lens Media Lab, described a project to use digital tools to measure the condition of YCBA's collection of Victorian-era carte de visite photographs.

Crockett has developed methods that can sort digital images of the photographs in ways that easily distinguish those in good condition from those that are the most faded and damaged. The approach will allow curators and conservators to survey the condition of an entire collection without having to personally judge each individual photograph.

"We're using information that has already been created by the digitization process, so we're not requiring any additional resources over and above what is already being done," he said. "The approach is quite a bit cheaper."

Judging the condition of a thousand individual photographs is a daunting task if left to an individual, Crocket noted, and the process becomes even more difficult when it is scaled up to include multiple groups of conservators at different institutions.

"How can we be sure that they're making the same judgment about conditions across all of these contexts?" he said. "One advantage of using the machine in this case is that it always makes the same judgment every time."

IPCH's mission includes engaging Yale students with the university's collections, and the conference featured several projects involving Yale students — both graduates and undergraduates.

"When I first learned to clean paintings, it was with cotton swabs and solvents," reflected Mark Aronson, the YCBA's chief conservator and chair of IPCH's Conservation Lab — a sprawling collaborative space shared by conservators, curators, and conservation scientists

responsible for studying and treating objects from Yale’s collections. “When we look at the projects the students present, it’s the younger generation that is bringing new ways of working to the older conservators.”

Genevieve Antoine, a postgraduate associate at IPCH, presented her work with Cindy Schwartz, associate conservator of paintings at YUAG, to compare image-processing techniques to evaluate the efficiency of using gecko micropillars — a type of nanotechnology — for cleaning surfaces covered in acrylic paint. Colin Hemez ’18 B.S. took participants on a photographic journey to Princeton Art Museum, where he and other undergraduates examined early pictorial photographs by Clarence H. White. Undergraduate student Daphne Martin presented on “Seeing Blue,” a project that studies polychromy — the ancient art of painting in multiple colors on sculpture, ceramics, and architecture —by applying instrumental analysis and digital imaging techniques to small stone sculptures. Olav Bjornerud, a pre-program conservation intern, discussed his collaboration with YUAG to better understand the history of coatings on Aristide Maillol’s “L’air,” which is on view on the museum’s fourth-floor sculpture terrace. Sarah Schlick, a pre-program conservation fellow, described her work with Theresa Fairbanks-Harris, senior conservator for works on paper at YUAG and YCBA, to recognize and transform discolored lead pigments in watercolor paintings.