

**CONSERVATION  
PERSPECTIVES**  
THE GCI NEWSLETTER

SPRING 2024  
ART & SCIENCE



Getty  
Conservation  
Institute

# A Note from the Director



Photo: Anna Flavin, GCI.

This fall will mark the start of *Art & Science Collide*, the third iteration of Getty's PST ART series (previously called Pacific Standard Time). This PST ART will feature fifty exhibitions in Southern California—including several organized by the GCI—that will delve into the intersections of art and science. In conjunction with this regional exhibition series, we're devoting this *Conservation Perspectives* to exploring the connections between art and science—and conservation. As noted within these pages, particularly in this edition's roundtable, art and science are in many respects two sides of the same coin. Both grow out of curiosity, and both are driven by a desire to know and to understand our world through a creative process. When they join in this pursuit of knowledge, interesting and insightful things can happen. Which is what *Art & Science Collide* is all about.

Our feature article is authored by two professors at the University of California, San Diego—Lisa Cartwright, an art and science historian, and Isabel Rivera-Collazo, a marine archaeologist—who examine the entanglements of ecological change with cultural sites, particularly those of Indigenous maritime peoples. They argue that the accelerating disappearance of coastal cultural heritage sites around the world has made collaboration among environmental and heritage conservators, archaeologists, historians, and Indigenous communities more urgent in the preservation of the art and artifacts within those sites.

In the first of our shorter articles, Annette S. Ortiz Miranda, a conservation scientist at the Walters Art Museum in Baltimore, emphasizes the need for a more diverse conservation science field, because backgrounds and identities shape the questions asked by scientists. Conservation science, she notes, is enriched by introducing a broad spectrum of methodologies and approaches essential for comprehensive

problem-solving. In their article, Susanne Gänssicke, a senior conservator at the Getty Museum, and Monica Ganio, a GCI chemist and scientist, present technical studies done on two objects from the ancient world—studies that demonstrate how interdisciplinary research involving scientists, conservators, archaeologists, and curators can result in a more holistic understanding of an object beyond its curatorial interpretation. In our final article, Katrien Keune, head of science at the Rijksmuseum, and Irma de Vries, a Rijksmuseum senior educator, describe two exhibitions at their institution that have brought science into the galleries to enhance the visitor experience and increase public engagement.

For this edition's roundtable, we invited three artists whose work will appear in *Art & Science Collide* exhibitions to share their thoughts on the connections between the making of art and the undertakings of science. Maru Garcia, Lia Halloran, and Sarah Rosalena all incorporate science and technology into their work and embrace the notion that both art and science grow out of the innate human desire to engage in discovery and in problem-solving.

In developing this edition, *Conservation Perspectives* editor Jeffrey Levin was aided by Tom Learner, head of GCI Science, as well as three other GCI scientists—Karen Trentelman, Vincent Beltran, and Joy Mazurek.

This is Jeff's final edition as *Conservation Perspectives* editor, after more than three decades in that position. The eighty-two editions he produced, and the many other communications endeavors he undertook on behalf of the GCI, have admirably served the Institute, Getty, and the conservation field. He is being succeeded by Patrick Pardo, who assisted with this edition and whose experience in publications management and familiarity with the field of art fully equip him to take up this publication's editorship. We will, nevertheless, very much miss Jeff's regular presence at the Institute both as a colleague and as a friend.

A handwritten signature in black ink, which appears to read "T. Whalen". The signature is fluid and cursive.

**Timothy P. Whalen**  
*John E. and Louise Bryson Director*

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**Untitled (cylindrical lens) (2022), by Fred Eversley.** Cast polyurethane, 108 x 30 x 14½ in. (274.3 x 76.2 x 36.8 cm). Eversley's Cylindrical Lens series draws on the artist's earliest body of work, the Cylindrical Cut series from the late 1960s, when he started exploring kinetic effects driven by light, energy, and physics. Before becoming an artist, Eversley worked for Wyle Laboratories as an electrical engineer on NASA's human spaceflight programs in the 1960s, among other aerospace contracts. Eversley's work will be included in the upcoming PST ART exhibitions *Lumen: The Art & Science of Light* at the J. Paul Getty Museum and *Particles and Waves: Southern California Abstraction and Science, 1945–1990* at the Palm Springs Art Museum. Artwork © Frederick Eversley, courtesy of the artist and David Kordansky Gallery. Photo: Tom Powel Imaging.

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# BENEATH THE WATERS

Resurfacing  
Submerged Landscapes and  
Indigenous History

BY LISA CARTWRIGHT AND  
ISABEL RIVERA-COLLAZO

The ocean and coasts that inspire art and science are also the stage for maritime cultures. Those who live on islands and in maritime settings recognize that our world does not end where the land meets the water. Territories, with their rich resources, continue in three dimensions: across the water's surface, down and across the water column, and into the ground below. Living close to the water provides access to food and inspires the design and fabrication of nautical technologies and other creative forms that are woven into maritime cultures.



Snapshot of the "digital twin" for the archaeology project led by Rivera-Collazo in Puerto Rico. The image shows multiple layers of data, including topography, vegetation cover, and the excavations of 2019. Image: Courtesy of Isabel Rivera-Collazo.



**Hurricane Maria triggered severe damage to Puerto Rico’s coastline.** These photos register the damage to the north coast of Puerto Rico. **Left:** A photomosaic of drone photographs taken in August 2017. **Right:** An aerial photograph taken in September 2017 after Hurricane Maria. The letters “a” and “b” indicate culturally sensitive areas. The numbers 1, 2, and 3 mark areas with severe damage due to coastal erosion and flooding. Images: Isabel Rivera-Collazo.

Coastal zones, however, are dynamic. They change with the sway of the waves and the oceans. When the sea level drops, the sea bottom becomes coastal land. When the sea level rises, ocean water drowns the land, submerging the structures and objects of coastal maritime cultures, both designed and natural. Human territories become undersea landscapes.

Conservation of art, artifacts, and the natural and built environment on land is subject to established protocols and practices among art historians, archaeologists, and environmental scientists. In this decade of ocean science, attention is increasingly turning to issues that come to the surface when cultural heritage sites and their art and artifacts are identified in or below the sea. Marine archaeology and ocean art history emerge as important areas in the work of conservation and for dialogue and collaboration among archaeologists, conservationists, historians, and descendant communities. This article—coauthored by an art and science historian (Lisa Cartwright) who researches ocean imaging and cultural meaning, and a marine archaeologist (Isabel Rivera-Collazo) who is Borikua (native to Puerto Rico) and who researches climate change, coastal geomorphology, and the relationship between people and the sea through time in island and marine ecosystems—seeks to contribute to this dialogue.

## CHANGING COASTAL LANDSCAPES

Our joint thinking about the practice of making meaning from the impact of climate change on maritime culture and heritage starts with Rivera-Collazo’s experiences with research and landscapes. As a native Puerto Rican, Rivera-Collazo has witnessed change. As an archaeologist, she has measured it with the help of engineers and other archaeologists. Her work shows that some

areas are undergoing change at a pace that outstrips predictive models. In a project she is overseeing on Puerto Rico’s north coast that includes a late pre-Columbian Indigenous (Taino) ceremonial center, serious loss has occurred. “Pieces of land where I had stood...didn’t exist anymore,” said project engineer Eric Lo on his return to Puerto Rico just a few months after Hurricane Maria in 2017. “They were underwater.”<sup>1</sup> The process of change is not limited to major events such as Category 5 hurricanes; it is constant and ongoing. The drafting of this essay in 2024 was interrupted by emergency travel by Rivera-Collazo to that ceremonial center she has been working on, to assess a particularly devastating amount of damage. The urgency and severity of changes bring conservators of art and the environment together not just to measure and explain change, but also to imagine and reimagine what has been, what is, and what could be.

The accelerating disappearance of coastal heritage sites around the world has made the dialogue among environmental and heritage archaeologists, conservationists, and historians more urgent. The pace of change challenges us to record data quickly and efficiently, seeing through the medium of water, and accounting for changes in the landscapes due to erosion of the shoreline and the undersea landscape. While most of this work traditionally has been performed with divers in the water or people on the ground, the pressing need for just-in-time documentation of sites has led to the use of remote sensing instruments, such as flyover and undersea equipment outfitted with cameras, lasers, acoustic instruments, or microphones—devices engineered to work with precision to image land, water, the water column, or the sediments beneath.

How to calibrate and validate the findings of these instruments and their various forms of data has emerged as a major project not

1. Quoted in <https://www.nbcnews.com/news/latino/puerto-rico-scientists-race-document-indigenous-sites-ahead-rising-sea-n1094061>





Rivera-Collazo and her postdoctoral research assistant, Andrés Garzón-Oechsle, accompanied by a group of community members (in the distance), work to rescue an archaeological deposit impacted by coastal erosion in spring 2024. Photo: Jenniffer Santos-Hernández.

only for environmental scientists but also for archaeologists and historians. Historians and conservators of art and architecture are now confronted with relatively new domains of research: the history of the advancement of sensing technologies devoted to documenting submerged objects; the relocation of tools of forensic inquiry to the conservation laboratory devoted to understanding provenance through genealogy, documentation, attribution, and the perplexing problem of identifying unfamiliar marks caused by immersion;<sup>2</sup> and the history of the science of discerning the effects of water on objects and structures long submerged. *Ocean media* is the term used by historian Melody Jue, who has written about the changes in our field orientation and experience introduced when we are compelled to engage in “seeing through seawater” to understand our past through encounters with submerged objects and landscapes.<sup>3</sup>

## INDIGENOUS INTERPRETATION AND STEWARDSHIP

The engagement of Indigenous peoples in the approach to disappearing coastal and underwater cultural heritage sites is an especially important matter for this dialogue among art and ocean archaeologists, historians, and conservationists. The maritime cultural landscapes that now lie submerged are part of the history

and cultural heritage of Indigenous people—from places that record migrations to Australia forty-five thousand years ago, to the landscapes of Doggerland,<sup>4</sup> to the submerged insular shelves of the Caribbean, and to the Paleolithic sites covering the shallows of the Gulf of Mexico. The descendants of those ancient communities still value the land of their ancestors, now beneath the sea.

In the documentation and conservation process, Indigenous authority over interpretation and stewardship is increasingly recognized as essential. Cultural traditions often mandate leaving sites deemed sacred under land and sea undisturbed by excavation and on-site exploration. This raises the question of whether remote sensing may provide culturally appropriate, noninvasive tools and approaches to study and preserve art, places, and sites at risk. Yielding detailed documentation, remote sensing systems are touted for their potential to offer “digital twins” of sites and objects that are off-limits to physical exploration, whether because of submergence or erosion, or because they are protected from disturbance. Either through direct or indirect exploration, through images and measurements taken on dives, or by noninvasive remote sensing, the decision to extract data from submerged sites must include Indigenous involvement, authorization, and advisement. This is no less true in environmental and marine archaeology than it is in the art conservation laboratory.

2. See, for example, documentation of the exhibition “Provenance: A Forensic History of Art,” on view at the Krannert Art Museum in Champaign, Illinois, in 2017. <https://kam.illinois.edu/exhibition/provenance-forensic-history-art>

3. Melody Jue, *Wild Blue Media: Thinking Through Seawater* (Durham, NC: Duke University Press, 2020).

4. <https://education.nationalgeographic.org/resource/doggerland/>



The existence of undersea remains of Early Holocene villages off the coast of California is well known to the descendants of the first inhabitants of the region, as well as to marine archaeologists and historians. Indigenous communities practicing the management of coastal resources and coastal botany—and using watercraft technologies—lived along the Pacific coastline for millennia. The Kumeyaay (Ipaí or Tipaí, also known as the Diegueño), the tribal group that now has jurisdiction over thirteen inland reservations in the United States and six ranchos in Mexico, are among the tribal peoples who occupied the coastal land from northern Baja California into what today is San Diego County, including the city of San Diego.

The Kumeyaay, who have called this area their home for the last twelve thousand years or more, were mariners who challenged European and Mexican occupation and control of coastal and island territories and the ocean between. They were pushed inland to foothill and mountain territories by European settler colonial expansion in waves of forced displacement and genocide authorized by missionary, military, and government forces. Colonial dispossession intensified in the nineteenth century, resulting in the loss of land and partial loss of language, art, and tangible remains of material culture, along with massive population declines due to imposed starvation, hardship, killings, and massacres. Evidence of the Kumeyaay presence on their ancient territory survives on this land in the form of archaeological remains, cultural memory, traditional knowledge, and other less evident markers.

Too often the tangible portion of that heritage has been disturbed by new inhabitants through the extraction of artifacts. Our place of work, the University of California, San Diego (UCSD), including the renowned Scripps Institution of Oceanography, sits on unceded territory of the Kumeyaay people. A founder of Scripps can be seen in an early-twentieth-century photograph holding a metate, a stone used for grinding acorns and grains. For decades, marine scientists removed Native artifacts on their dives and excavations on shore, sometimes displaying them alongside marine specimens. In recent years, institutions have begun to repatriate these artifacts, and there is growing acknowledgment of the need to establish ethical means of restitution and reparative justice.<sup>5</sup>



**In the Eye of the Storm by Simona Clausnitzer.** The artist describes this 2020 linocut print as illustrating “the lived experiences of hurricanes, specifically Hurricane Maria. As the climate continues to change, catastrophic storms are expected to become more severe in the Caribbean region... The piece is...depicting the storm itself, the infrastructural impacts, and the human impacts.” The work was awarded second place in the Art x Climate art gallery featured in the US government’s Fifth National Climate Assessment. Image: Courtesy of the artist.

In 2023 those engaged in California’s conservation of inter-linked Indigenous art, artifacts, heritage sites, and ecosystems were confronted with state audit findings that the University of California was failing to return hundreds of thousands of Native American remains and artifacts to their tribes of origin, despite decades-long federal and state legal mandates to do so.<sup>6</sup> The mandate for repatriation from the collections of the state’s museums and archives becomes a question of pressing concern for art historians and archivists regarding not only those artifacts and remains in collections but also those in locations contiguous or overlapping with scientific research sites. Photographs, digital data, and other forms of documentation are now, too, an important subject of consideration among ocean and art conservators insofar as representation and simulation techniques hold an important place in documenting the remains of environmental and cultural history without physically disturbing them. How to handle the historical records obtained through underwater photography and remote sensing technologies such as acoustic and laser imaging is a matter for art and cultural heritage conservators to resolve with tribal authorities. This points to the need for advancing the inclusion of tribal members in the newly interdisciplinary field of ocean science and art conservation.

## BRIDGING ENVIRONMENTAL AND CULTURAL CONSERVATION

In *Embodied Pacific*, a Getty PST ART Art & Science Collide collaboration between UCSD Visual Arts and the UCSD Scripps Institution of Oceanography, Indigenous ocean science, technology, art, and craft are at the center of two of the eighteen projects to be featured in a group of exhibitions at sites that include the Birch Aquarium at Scripps, the Qualcomm Institute, the University of California Kendall-Frost Reserve at Mission Bay,

and Kosay Kumeyaay Market in Old Town, San Diego. These projects highlight Indigenous ocean art and science, with two projects featuring the making of canoes, baskets, and nets as aspects of a living culture that finds its history not only in collections but also in the ecosystems of the ocean and shore. Art and artifact conservation is a practice typically conducted in laboratories or in makeshift

5. Patty Gerstenblith, “Historical Appropriations: Of Time and Reparative Justice,” in *Cultural Objects and Reparative Justice: A Legal and Historical Analysis* (Oxford, UK: Oxford University Press, 2023; online edition, Oxford Academic, October 19, 2023). <https://doi.org/10.1093/oso/9780192872104.003.0007>, accessed April 2, 2024.

6. The 1990 Federal Native American Graves Protection and Repatriation Act (NAGPRA) and the 2001 California Native American Graves Protection and Repatriation Act (CalNAGPRA).





**Top: Photogrammetry of a Kumeyaay tule boat** made by a team headed by Stan Rodriguez, a PhD social scientist and Kumeyaay elder. Rodriguez organizes workshops on making *ha kwaiyo*, traditional Kumeyaay boats assembled from tule reeds gathered along the shores of Southern California’s inland lakes. Photogrammetry: Scott McAvoy and Jessica Ashook, 2022. **Above: Historic row-out of 24 Kumeyaay ha kwaiyo** led by Rodriguez at the UC Kendall-Frost Marsh Reserve at Mission Bay, San Diego, September 2021. Photo: Lisa Cartwright.

labs set up during excavations. In the work of Dr. Stan Rodriguez (Santa Ysabel Band of the Iipay Nation), cultural conservation is conducted through hands-on workshops in the making of *ha kwaiyo*, traditional Kumeyaay boats assembled from tule reeds gathered along the shores of Southern California’s inland lakes, and in row-outs that immerse participants in the coastal waterways that hold the heritage of the Kumeyaay. Among the newer technologies of art and science in cultural conservation, “digital twins” stand out because of the potential they offer to gather data from submerged sites and artifacts and to model their past, present, and future conditions without physical trespass.

The interface of ocean science and cultural heritage conservation is a focus of work for coauthor Rivera-Collazo, a marine archaeologist studying the past of her own people. Her practice has helped raise questions about how we uncover, observe, and study data derived from landscapes that bear sacred and protected legacies of the Borikwas. Although she is now based in Kumeyaay land, she has concentrated her studies and research on the territory of her ancestors (also subjected to violent displacement and subjugation) and the region where she has the strongest ties

to the land and sea: the Caribbean. Her work seeks to illuminate the bridge from environmental conservation issues, such as climate change, sea level rise, and erosion, to cultural conservation and meaningful participation of descendant communities—a matter of primary concern for art conservators and art historians alike. A close relationship can and does exist between marine archaeology, art, and art history in its social dimensions, and between conservation specialists and local elder and community leaders who are experts in Indigenous histories and traditions. While it is possible to recover a history lost through colonization, genocide, and systematic erasure, the evidence of that past is also disappearing fast, and therefore digital recording and remote sensing data are important tools. However, producing digital data is not the sole consideration—we also must consider data literacy, where the information will live, and who can access it. By digital literacy, we mean not simply the ability to “read images” but also the ability to know and understand the history from the perspective of the culture it memorializes. Digital data storage is an issue of major concern, as are the related issues of data access, privacy, and sovereignty.



Rivera-Collazo illustrates this point in her 2015 essay “Por el camino verde,”<sup>7</sup> named after a song with a verse that describes walking down a path covered in green foliage and aromatic flowers leading to an ancient hermitage. The verse’s visual and sensory imagery combines the green lushness and scents of a tropical island with the ancient ruins that mark human presence on the land, inspiring us to think about how those rich and productive tropical ecosystems grow over and hide the evidence of the past, leading those unfamiliar with local history to think of tropical islands as pristine. This observation reminds us of the existing contradictions between conservation and human activity. On one hand, the idea of island vulnerability identifies a delicate balance of biodiversity that can be easily disrupted by human presence. On the other, modern ecosystems and ecological communities on inhabited islands, often classified as biodiversity hot spots deserving conservation, are the product of long-term interventions and actions by human societies. Conservation efforts often fail both to acknowledge the engagement of people within their ecosystems and to recognize how those interactions influenced the same elements that make islands as we see them today, the places rich in biodiversity that we strive to protect. This historical knowledge, often held within the culture and not within the archive, is the literacy to which we refer.

Like the landscapes of the Caribbean, the land and sea of Southern California are not an empty canvas. For thousands of years, Indigenous communities and the many historical processes and events affecting them have shaped, curated, and maintained the world in which we live today; the marine, coastal, and submerged territories of Southern California’s tribal communities are part of their past, present, and future. They hold the tangible remains of a people’s history, they remind us of the natural and social processes that shape their realities, and they hold the promise of recovering a partially forgotten history, enlarging our understanding of the past. They are pages of books that are not yet written or read, and they should be researched and written by the region’s Indigenous authors.

## SHAPING THE STORY TOLD

When we art and ocean science historians and archaeologists connect to consider the prospect of further uncovering and telling that history submerged off California’s coast, we must recognize and engage with the people who hold ancestral territorial rights over these sites, and whose story it is to tell. Submerged landscapes and villages, and the history of Indigenous people, are obscured not simply by sea level rise, but by forced migration, gentrification, and continued abuse brought on by European and Western colonialism. The survivors, who have inherited the effects of that history, must be part of the process and leaders in the recovery of the stories of their past, on their own terms.

In our effort to document through technologies and the collection of data in the service of building digital models, we may learn a lesson from the photographic archives that are the territory



**Scripps Institution of Oceanography cofounder William Ritter with a metate**—an Indigenous grinding stone—in 1918. For decades, marine scientists removed Indigenous artifacts on their dives and excavations onshore, sometimes displaying them alongside marine specimens. In recent years, institutions have begun to repatriate these artifacts. Source: Bennett Family Papers. SMC 48. Special Collections & Archives, UC San Diego.

of the art historian. We return to the photograph of William Ritter holding a metate, an image embodying a fantasy about his inclusion in an Indigenous ritual of pounding acorns. This photograph can help us recognize that the very process and labor of extraction, even remotely and noninvasively carried out through image- and data-twins, shape the story that is told. It is the work of the art historian to insist we remember that our methods of documentation and conservation, as well as the matter of authorship, structure the relationship of power, knowledge, and sovereignty concerning the culture unearthed, whether physically or virtually. This holds true for environmental conservation, for marine archaeology, and for the conservation of art and cultural artifacts.

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7. <https://escholarship.org/uc/item/6jg1r084>

# FORGING PATHS

## The Essential Role of Latinas in Shaping Conservation Science Perspectives

BY ANNETTE S. ORTIZ MIRANDA

WHEN FIRST INVITED TO SHARE MY THOUGHTS ON Latinas in conservation science, I experienced a complex array of emotions, ranging from happiness to bitterness. For a moment, my dormant impostor syndrome resurfaced, compelling me to grapple with the feeling of having to justify my presence—or the validity of Latinas generally—in the field, alongside our well-represented white colleagues. If I was supposed to be where I am, why would I need to write an article about it being extraordinary?

My upbringing and education in Puerto Rico shielded me from the sense of being part of a minority group. However, this perspective shifted upon relocating to Europe to pursue a career in conservation science. I then found myself consistently defending my place in the field, burdened by the minority label imposed on me. On my first day of class in Spain, when I shared my aspirations for a PhD, I received a skeptical response from a professor—“Ya veremos” (“We shall see”). It was notable that among the students in the room who shared similar ambitions, I was the only Latina and the only one who did not receive motivational acknowledgment.

Despite past experiences of feeling like I did not belong, I came to see this article as an opportunity to connect with other Latinas who are passionate about—or who want to enter—conservation and conservation science. Our presence is not only valid but crucial for the field, serving to broaden perspectives and approaches to conservation itself.

### DIVERSITY IN CONSERVATION SCIENCE

To delve into the issue of the lack of Latina conservation scientists requires acknowledging the decline in interest in careers in science, technology, engineering, and mathematics (STEM) globally, including in the United States. This disinterest translates into a continuing shortage of conservation scientists and personnel qualified to teach science in conservation programs worldwide. In recent years, scientific organizations have urged that STEM career education be strengthened globally, emphasizing underrepresented groups such as minorities and women. For example, despite Latinos/as constituting approximately 18 percent of the total US workforce, their presence in STEM careers remains notably low, with only 8 percent pursuing such paths. This concerning trend is further accentuated



Conservation scientist **Annette S. Ortiz Miranda** with the painting *Alice* by Amedeo Modigliani, in the collection of the Statens Museum for Kunst/ National Gallery of Denmark (SMK). Ortiz worked at SMK prior to her appointment to the Walters Art Museum. Photo: SMK Photo/Niels Mortensen.

when examining Latinas in the workforce, where, as of 2018, they represented a mere 7 percent, with less than 2 percent occupying STEM jobs, as reported by the Pew Research Center.<sup>1</sup>

In the context of conservation-related disciplines, the AIC 2022 report<sup>2</sup> revealed that Latino/a individuals constituted only 5 percent of the positions in the US and its territories, with only a fraction dedicated to conservation science. In addition, the lack of both conservation science-oriented graduate programs and general awareness in the United States and its territories limits its potential as a career choice. The paucity of Latino/a conservation professionals is a problem, considering the vast amount of cultural

1. <https://www.pewresearch.org/social-trends/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/>  
2. [https://www.culturalheritage.org/docs/default-source/publications/reports/survey-reports/2022-faic-compensation-survey.pdf?sfvrsn=75c01720\\_5](https://www.culturalheritage.org/docs/default-source/publications/reports/survey-reports/2022-faic-compensation-survey.pdf?sfvrsn=75c01720_5)



heritage housed in many US museums from our Latino/a Indigenous ancestors. Urgent and concerted efforts are imperative to rectify this disparity and to cultivate a more inclusive and representative conservation science community.

It is crucial to push for a more diverse conservation science field because our backgrounds and identities shape the questions we ask as scientists. Involving diverse scientists is not just a matter of representation; it *enriches* the essence of conservation science, introducing a broad spectrum of methodologies and approaches essential for comprehensive problem-solving and for fostering collaborative environments. The call to increase diversity among scientists transcends ethical considerations; it is an instrumental step towards advancing the field and ensuring its resilience in the face of evolving global conservation needs. Cultural perspectives have a profound effect on how scientists formulate research inquiries, interpret data, and communicate their findings to others. A well-documented example is the tendency of Latino/a researchers to investigate disparities<sup>3</sup> more frequently than their white counterparts, who often focus on white populations and neglect disparities. Many museums and collections are filled with objects from all sorts of cultures; engaging individuals from diverse backgrounds in preservation and research is essential to correctly interpret and frame the objects from their own cultural perspective.

There is a general perception that science helps us make sense of the world around us and uncover new knowledge. However, in conservation science, when research is focused exclusively on the materiality of a collection or an object, the definition of “new knowledge” becomes subjective. Because much of the world’s cultural heritage is extracted from its original context and transformed into decorative objects, recognizing the historical background of objects is as important as their materiality in scientific research investigations. Research on collections and objects must include the traditional knowledge passed down through generations of families and communities. So-called “new knowledge” to some may be community knowledge to others. The Latin American culture is deeply rooted in oral traditions, which may be interpreted as “new knowledge” by outsiders. Such sociocultural and environmental knowledge can provide valuable insights in contrast to the Western-centric views that strongly influence the conservation science training programs that may not incorporate Latin-American perspectives.

The answers to inquiries concerning objects from the ancient Americas within collections may be discovered through an exploration of oral traditions. Latinos/as possess the capacity not only to shape the trajectory of research inquiries but also to influence the ethical considerations underpinning the investigation of objects and collections. Additionally, their contribution extends to advocating for examination of collections and objects that may otherwise remain in storage because of a lack of interest from other populations or individuals. The field of conservation science stands to gain

3. In this context, disparities encompass imbalances affecting racial and ethnic minorities, individuals with low socioeconomic status, those residing in rural areas, and populations identifying as sexual and gender minorities within the United States.



**Ortiz with students from the Escuela Central de Artes Visuales in San Juan, Puerto Rico, visiting the Museo de Arte de Puerto Rico.** Ortiz is explaining the scientific examination of paintings from Puerto Rican artists. Photo: Courtesy of Annette S. Ortiz Miranda.

significantly from the distinctive perspectives of Latinas, which are informed by their diverse backgrounds, experiences, cultures, and concerns. Drawing from their personal histories equips them with nuanced perspectives that can be applied to contemporary issues or challenges in the future. Latinas have a vital role to play in preserving and researching cultural heritage, contributing their unique insights and enriching the field.

## A PEOPLE-CENTERED APPROACH

For many years I concealed my Latina heritage as a way to navigate the conservation field successfully. Being the only person of color in the room became my *norm*, and it took some time before I found the courage to make my voice heard. Observing my surroundings and the dynamics in those rooms heightened my awareness of the unique nuances embedded in my perspective. Today I’m more conscious of my heritage and of what I can contribute to the conservation science field as a Latina. Recognizing this, I have shifted from the fully focused material-based research method in which I was trained to a more people-centered approach with space for oral tradition.

Embracing this hybrid thinking allows me to combine scientific rigor with insights from culturally meaningful social and community knowledge. This gives me the ability to integrate different ways of thinking, jump between them, and align them to work toward a team goal of advancing our understanding of our cultural heritage. For instance, when preparing mock-ups, recollections of my grandmother engaged in her craft inevitably resurface. I am reminded of her explaining the differences in



**Ortiz and Daniela González-Pruitt, a paintings intern, at the Walters Art Museum, examining a 19th-century painting of Our Lady of Guadalupe.**  
Photo: Pamela Betts.

materials when collecting pigments from nature to paint *Vejigante*<sup>4</sup> masks or ceramics. The transfer of this ancestral wisdom from her to me and its subsequent manifestation in a museum lab is an example of the cultural continuum. Similarly, I remember collecting an array of seashells at the beach for her work, which prompted her to share her knowledge about the properties and applications of these marine organisms. This knowledge traces its origins to the Tainos,<sup>5</sup> who utilized seashells such as the queen conch and Atlantic triton in crafting objects like spoons, plates, tools, ornaments, and religious artifacts. I find myself naturally incorporating this intrinsic knowledge into the way I understand my role as a conservation scientist, weaving a tapestry that connects the wisdom of the past with the pursuit of understanding and preserving our cultural heritage in the present. By engaging in a people-centered approach (as I have done) and recognizing the value of diverse perspectives, we can ensure a more inclusive and innovative future for conservation science.

Breaking barriers in conservation science requires promoting diversity and integrating traditional knowledge, while acknowledging the decline in STEM interest. A potential pathway to reversing this trend involves addressing the root causes by equipping the right individuals with essential tools. Career development studies highlight various factors influencing professional career choices, including those that relate to an individual's personality and to the environmental context in which they develop. Research indicates that positive perceptions of the educational environment correlate with favorable attitudes toward learning, science, academic achievement, and academic self-efficacy. In the intersection of history, art, and archaeology, conservation science emerges as a captivating

mix of disciplines capable of unraveling ancient questions about heritage. The fusion of STEM and art renders the conservation science field appealing to a new generation of Latino/a scientists, with room for innovation.

I am passionate about promoting diversity and inclusion in STEM, which are key to innovation and promoting creativity in addressing the needs of a broad population. Conservation science, for me, is not just a profession but also a powerful tool and ally enabling me to impact young Latinas through mentorship and STEM-oriented programs. Common deterrents for Latino/a students considering STEM careers include the perception of difficulty, the lack of mentoring, and limited access to quality education. As a Latina and Puerto Rican, I am committed to giving back and uplifting others, inspired by my own experience of lacking mentorship in my career. Now I cultivate mentoring relationships, believing in the power of the collective knowledge within the Latina community.

Collaborating with Ciencia Puerto Rico and its program, Científicos al Servicio, has allowed me to engage with students K–12 and with educators. Additionally, participating as a mentor in the Semillas de Triunfo (Seeds of Success)<sup>6</sup> program, guiding middle school girls in developing projects in any STEM field, has been particularly rewarding. Notably, involving the parents in the entire process is a vital aspect, as it helps them understand the significance of STEM and provides participants with strong home support to pursue their aspirations. Finally, as a member of the world's largest virtual collection of profiles featuring Latina scientists, an open-access online resource created by IF/THEN,<sup>7</sup> I contribute to motivating young women by addressing the lack of visibility and access to role models in the field.

## DIVERSE PERSPECTIVES

The integration of diverse voices and perspectives is indispensable in fostering a thriving and innovative STEM community. By actively engaging in mentorship, educational programs, and advocacy, we can collectively strive to establish an inclusive environment that empowers Latino/a scientists and engenders a brighter future for individuals, the scientific community, and the conservation field as a whole. As we work toward breaking down minority barriers, we need to aspire to the goal of creating a future where there are no distinctions, only scientists. Once achieved, conservation will be richer for it.

*Annette S. Ortiz Miranda is a conservation scientist at the Walters Art Museum in Baltimore.*

4. The Puerto Rican *Vejigante* is a folkloric character and at the same time a cultural display representing the convergence of cultures that shaped Puerto Rican identity, including Spanish religion, African drum music in the form of *bombas* and *plenas*, and the Tainos impact on the essential component of the costume—the mask, also known as the *careta*. The selection of materials crafting the mask, including papier-mâché, ditas sourced from the higuera tree, and dried coconut shells, varies by region.

5. The Tainos were the culturally advanced descendants of the Arawak-speaking peoples of the Caribbean who arrived in the Antilles from South America. The Tainos spoke Taino, a language of the Arawak family that was spoken only in the Greater Antilles at the time of the Spanish conquest.

6. <https://www.cienciapr.org/es/seeds-success/semillas-de-triunfo-programa-de-chicas-embajadoras-stem>

7. <https://www.ifthenshecan.org/about/>



# ANCIENT METALS

## The Art of Unraveling Early Technologies



BY SUSANNE GÄNSICKE AND MONICA GANIO

COLLABORATION AND CROSS-DISCIPLINARY WORK are essential aspects of any successful research endeavor. In the study of art and archaeology, the collaborative efforts of scientists, conservators, and curators have created a rich body of knowledge about the materials and methods used to create works of art, which has provided valuable insight into artists' creative processes, as well as how the objects were used and valued by the cultures that created them.

For many periods in history this information is available, at least to some degree, through artists' notes, diaries, archives, and oral traditions. This is not the case, however, for most ancient works of art. Even though some Greek and Roman texts contain treatises on materials and working techniques of ancient craftspeople—such as Pliny the Elder's *Natural History*, with a plethora of information on the industries of his time—the recipes can be difficult to interpret or may not be accurate representations of actual processes.

Looking to the objects themselves for information similarly presents challenges. Archaeological materials degrade over time in response to exposure to light and humidity, atmospheric pollutants, and burial environment. As a result, painted surface layers can change or lose color, as with polychrome marble sculptures, now

appearing mostly white. Metal surfaces can become structurally or chemically unstable, with advanced corrosion and mineralization modifying their shape and appearance.

Two technical studies undertaken by Getty staff on archaeological metals—including bronze, silver, and gold—highlight the benefit of interdisciplinary research involving scientists, conservators, archaeologists, and curators. The studies also demonstrate how the inclusion of living artists in efforts to reverse-engineer past technologies (with their tactile, practical craftspeople's knowledge) has resulted in a more holistic understanding of an object beyond its curatorial interpretation.

### THE PARTHIAN RHYTA

Horn-shaped luxury drinking vessels, or rhyta, from the ancient Parthian Empire (247 BCE–224 CE) in Central Asia have intrigued generations of researchers. Expanding on older traditions with inventive new shapes, in particular animal-shaped protomes (the decorative element in the front sections), rhyta were created over centuries in the fluid, international world that thrived along the ancient Silk Road. A special exhibition on ancient Persia in 2022 at the Getty Villa, *Persia: Ancient Iran and the Classical World*, provided an opportunity to look deeper into how these complex and luxurious objects may have been created.

**The Stag Rhyton (left), and its X-radiograph (right)** showing the presence of lead in the head. Parthian. 100–1 BCE. Gilded silver, glass; 25.6 x 33.3 x 12.5 cm (10 x 13 $\frac{1}{8}$  x 5 in.). J. Paul Getty Museum. 86.AM.753. Images: Courtesy of the J. Paul Getty Museum.

The Getty collection includes four Parthian rhyta with different animal protomes: a stag, a lion, and two lynx. All four vessels were created using a relatively pure silver alloyed with minor amounts of gold and copper, and seemingly free of lead,<sup>1</sup> with gilded decorations added by fusing gold leaf (or thin sheet) onto the silver substrate. The animal shapes of the front sections all were mechanically raised from the silver sheet, but differences in the manufacturing approach emerged in the details: the antlers and front legs of the stag and lynx were cast solid (added by soldering), while the lion (the largest of the group), has hollow legs entirely worked in repoussé! Also, curiously, a lump of lead was detected inside the stag's head. Why? Did it have a physical function, such as to balance the vessel while drinking, or was it meant to inflate the weight, and therefore its value?<sup>2</sup>

To help understand some of these observations, we sought input from a contemporary, practicing silversmith, Adam Whitney. Whitney previously worked on the re-creation of a rhyton protome in the shape of a deer at the Harvard Art Museums,<sup>3</sup> which inspired him to create a modern rhyton with an astronaut as the protome!<sup>4</sup> During a scholarly study day, held in conjunction with the Getty exhibition on ancient Iran, his hands-on experience in creating a rhyton provided valuable insights into the challenges of raising complicated shapes from a single sheet of thin silver. Our new observations, together with studies of rhyta in other collections, will potentially reveal regional differences and characteristics of artists' workshops that will significantly expand our understanding of how these remarkable vessels were created.

## THE MENSA ISIACA

Some rare and exceptional objects have fascinated scholars over centuries while evading our grasp of their narrative. The Mensa Isiaca, a bronze table decorated with elaborate polychrome metal inlays of Egyptian-style figures and dated to the first century CE, is one of those pieces: it is unique and without context. It belongs to the Roman period yet draws on ancient Egyptian traditions. When was it made, where, and by whom—and what did it originally look like?

A major technical study by the Getty Museum, the GCI, and the Museo Egizio in Turin aimed at understanding the Mensa's materials and manufacturing processes used noninvasive and non-destructive examination methods, including optical microscopy, X-ray fluorescence (XRF) spectroscopy, macro XRF (MA-XRF) scanning, and X-radiography. Results revealed that the base and inlaid figures were created utilizing at least seven distinct alloys: multiple copper/zinc alloys, silver, and a copper/gold alloy that appears black.<sup>5</sup>

Of particular interest were the data provided by the MA-XRF elemental maps. The map of silver provided, for the first time, a clear and accurate image of the iconography and pseudo-hieroglyphs, which will enable scholars to better study the decorative scheme, identify new patterns within the pseudo-hieroglyphs, and potentially explain their selection and origin. The maps of copper and zinc unexpectedly revealed that the alloys chosen for clothing and skin tones were always applied in complementary pairs. This obviously deliberate choice of contrasting alloys would have resulted in a visually vibrant composition. Unfortunately, over the centuries much of the original appearance of the Mensa has been lost. However, the new technical information allowed the team—in collaboration with Johana Herrera, lead imaging technician at the Getty<sup>6</sup>—to create a digital visualization of the original experience of the Mensa, offering a sense of what surely was a masterpiece of its time.

This new information about the Mensa provided fodder for in-depth discussions at a symposium held in Turin in July 2023, bringing together art historians, archaeometallurgists, scientists, conservators, and metal artist Ford Hallam. Once again, the inclusion of a contemporary artist added a unique and valuable dimension to the discussions. Hallam works in the historical Japanese tradition of *irogane*, using alloys of gold, silver, and copper, assembled and often inlaid into a base metal to produce multicolored images, enhanced by patination. While the Mensa is from a much older time and a different culture and location, it



**A modern rhyton with an astronaut as the protome** (an adornment in the form of a head and upper body of an animal or human). Created by Adam Whitney, a contemporary American silversmith. Image: Loam. Courtesy of Adam Whitney.

1. The absence of lead has been previously reported. See Pieter Meyers, "Technical Examination of Silver Objects in This Catalogue," in Martha L. Carter, Prudence O. Harper, and Pieter Meyers, *Arts of the Hellenized East: Precious Metalwork and Gems of the Pre-Islamic Era* (London: Thames & Hudson Ltd., 2015), 377–91; Angela Chang and Katherine Eremin, "Ancient Silverworking: A Technical Case Study," in Susanne Ebbinghaus, editor, *Animal-Shaped Vessels from the Ancient World: Feasting with Gods, Heroes, and Kings* (New Haven, CT: Yale University Press, 2018), 166–69; Jerry Podany and David A. Scott, "Analytical and Technical Studies of a Collection of Silver Bowls and Silver Rhyton in the J. Paul Getty Museum," unpublished manuscript in the Getty Museum Antiquities Conservation archives.

2. <https://asia.si.edu/whats-on/events/search/event:166293864/>

3. Angela Chang and Katherine Eremin, "Ancient Silverworking: A Technical Case Study," in Susanne Ebbinghaus, editor, *Animal-Shaped Vessels from the Ancient World: Feasting with Gods, Heroes, and Kings* (New Haven, CT: Yale University Press, 2018), 166–69.

4. <https://aw-metalsmith.com/adam-whitney#/emu-rhyton-2/>

5. Parallels to this copper/gold alloy are found in the Japanese tradition, where a similar alloy is known as *shakudo*. Black-colored bronzes with small amounts of copper have increasingly been identified from the ancient Egyptian, Greek, and Roman world and have led to in-depth manufacturing studies.





**Left: The Mensa Isiaca, a bronze table** decorated with elaborate polychrome metal inlays of Egyptian-style figures and dated to around the first century CE. In the collection of the Museo Egizio, Turin; Cat. 7155. Photo: Courtesy of Museo Egizio. **Right: RGB false color overlay of MA-XRF distribution maps** of copper (red channel), tin (blue channel), and zinc (green channel). Where more than one element is present in a single pixel, the resulting color reflects the relative proportion of each element present. Inset figures highlight the use of specific alloys to achieve different skin colors. Image produced by the authors.

similarly was created by bringing together different alloys that may have been at least partially patinated. Hallam’s experiences provided a more tangible understanding of the challenges faced by ancient artisans in producing the colorful and contrasting images on the Mensa, and sparked interest in further replication experiments, getting us a step closer to understanding the ancient work processes.

## ART AND SCIENCE INTERSECT

The intersection of art and science is not new, and assembling a multidisciplinary team, including contemporary artists, to understand ancient technologies is of course not unique to Getty. Sanchita Balachandran<sup>7</sup> at Johns Hopkins University has led workshops exploring ancient Greek pottery and has conducted experimental archaeological work to re-create ancient Attic pottery. Stefan Hagel<sup>8</sup> at the Austrian Academy of Sciences has worked for decades with musicians and instrument builders to explore the musical potential of auloi, ancient wind instruments used widely in the ancient world from the Mediterranean region to Africa and Central Asia.

Contemporary artists are also influenced and inspired by the

study of ancient or historic technologies. For example, Makoto Fujimura utilized traditional methods of manuscript illumination to create modern illuminations to commemorate the four-hundred-year anniversary of the King James Bible.<sup>9</sup> The artist Charlotte Caspers, based in the Netherlands, collaborated with several museums in the Netherlands and abroad (including the Van Gogh Museum and Tate Britain), focusing on understanding old master paintings and then using many of the techniques in her own works.<sup>10</sup>

Bringing together the different viewpoints—scientific, historic, technological, and creative—enables us to appreciate such ancient and historic objects (including the metal objects described here) beyond their material value as works created by extraordinary skill and, sometimes, by means that remain beyond our comprehension. Future researchers may have tools and equipment that will allow them to go boldly where we could not.

*Susanne Gänsicke is the senior conservator in the Antiquities Conservation department of the J. Paul Getty Museum. Monica Ganio is an associate scientist in the GCI Science department.*



**Digital color reconstruction with proposed original appearance.** Note: Missing, damaged, or corroded areas were not reconstructed; this reconstruction focused only on providing an indication of how the original colors and textures may have appeared. Digital reconstruction by Johana Herrera; © J. Paul Getty Trust.

6. Susanne Gänsicke, Monica Ganio, Arlen Heginbotham, Douglas MacLennan, Jeff Maish, Johana Herrera, and Karen Trentelman, “Mensa Isiaca: New Findings on Its Composition, Construction, and History,” *Rivista del Museo Egizio* 7 (June 2023).

7. Sanchita Balachandran, director of the Johns Hopkins Archaeological Museum and associate teaching professor, Department of Near Eastern Studies, Johns Hopkins University.

8. Stefan Hagel, senior researcher at the Institute for the Study of Ancient Culture of the Austrian Academy of Sciences.

9. <https://makotofujimura.com/art/portals/four-holy-gospels>

10. <https://www.charlottecaspers.com/about>



# UNLOCKING ART'S WONDERS

## Science as a Bridge to Public Engagement



BY KATRIEN KEUNE AND IRMA DE VRIES

SCIENTIFIC RESEARCH TRADITIONALLY HAS BEEN conducted behind the scenes at museums. However, since World War II it has occasionally found its way into museum galleries. In 1961, for instance, the Prado Museum exhibited large-format X-radiographs showcasing Velazquez's paintings. More recently, scientific research now occurs in the presence of the public. For example, in 2018 the Mauritshuis in The Hague publicly conducted an in-depth scientific examination of Vermeer's *Girl with a Pearl Earring*. More and more museums are exploring ways to make science accessible to their audience. The Rijksmuseum recently mounted two exhibitions where science was openly shared with the public in the museum. What did we learn? What is the added value of incorporating science in art museums? And how do you communicate science in a meaningful way to your audience?

The presentation of scientific research in art museums seeks to enhance understanding of the art-making process and the conservation of art in museum collections, with the intention of engaging the public on a different level. Visitors in museums often perceive only the “finished product”—the object or artwork. By

providing the public with a behind-the-scenes look at research being performed, visitors gain greater understanding of the scientific process, of how artists create, and of how museums care for their collections. This idea has been confirmed by public surveys the Rijksmuseum has conducted.

### TWO CASE STUDIES FROM THE RIJKSMUSEUM

Bringing science into the museum gallery requires careful thought and alignment with both the museum and the public. With the two instances of bringing science into the museum galleries at the Rijksmuseum—*Operation Night Watch* and the temporary family exhibition *Mission Masterpiece*—important insights were gained.

In the summer of 2019 the Rijksmuseum embarked on a multiyear project with the goal of thoroughly studying the condition and painting technique of Rembrandt's masterpiece, *The Night Watch* (1642), in order to develop the best treatment plan. This is being done in situ, in the gallery inside a glass enclosure in full view of the public. The painting has been investigated using the most advanced and innovative research methods, including imaging, computational, and visualization technologies.

**Rembrandt's *The Night Watch* (1642) at the Rijksmuseum.** Since 2019 the museum has been engaged in a multiyear project studying the condition and painting technique of the work, in order to develop the best treatment plan. This is being done in situ inside a glass enclosure in full view of the public. Photo: Rijksmuseum/Reinier Gerritsen.



The second case, *Mission Masterpiece*, was a temporary exhibition presented in summer 2023 for children and their caretakers, focusing on conservation and science. The entirely interactive exhibition aimed to immerse children in the role of scientists, encouraging them to investigate various objects and use the same methods and techniques employed by museum experts.

### **Operation Night Watch**

To inform our audience about the research on *Operation Night Watch*,<sup>1</sup> we utilize not only gallery texts and online information, but also an Ask-Me guide stationed by the glass enclosure, who interacts directly with the public. Certain questions are asked consistently, such as why research is necessary, why this painting has significance, and what the ultimate objective of the research is. As a result of the interaction with the public, the Ask-Me guide provides valuable insights for museum education staff on ways to enhance communication of vital research techniques, leading to better audience engagement. Furthermore, scientific research in museums not only directly impacts museum visitors, but also reaches a wider audience through online channels and publications. For example, the ultrahigh-resolution photo of *The Night Watch* on the Rijksmuseum website got half a million views within the first few days, and our publication on the discovery of a lead-based impregnation layer using high-tech synchrotron-based techniques reached over half a billion people worldwide. This confirms a strong public interest in the intersection of art and science. And what we have learned from getting in touch with our audience directly is helping us improve communication both inside and outside the museum. For example, we make adjustments in the gallery texts and the audio tour stop at the *Night Watch*, as well as in the information provided for our project *Night Watch* on Tour, where a life-size replica of the *Night Watch* is being taken to nursing homes and senior complexes.

### **Mission Masterpiece**

In contrast to *Operation Night Watch*, for *Mission Masterpiece*<sup>2</sup> it was imperative to actively involve the target audience (families with children from ages eight to twelve) in the development phase, given that the exhibition, once opened, could not be modified. Through collaboration with hundreds of children, we learned that it was crucial to get to the core of all activities and not to convey too much information. This posed a challenge when working with scientists accustomed to delivering nuanced and well-founded narratives, and (for the audience) in complex terminology. Above all, we had to prioritize simplicity in all activities, as well as in the exhibition.

In the audience research conducted prior to *Mission Masterpiece*, we discovered that this exhibition indeed had the potential to “unlock” the museum in a different way. While families initially

associated the Rijksmuseum with terms like “paintings,” “old masters,” “traditional,” and “boring,” their perception changed after visiting the *Mission Masterpiece* exhibition. They described the museum as “modern,” “playful,” “innovative,” and “child-friendly.” The exhibition received an overall rating of 9.1 (out of 10) afterward, with nearly 80 percent expressing an intention to return for similar offerings. Moreover, almost 60 percent had never visited the Rijksmuseum before, indicating that the subject and approach genuinely appealed to a new audience.

## **ENHANCING PUBLIC UNDERSTANDING AND ENGAGEMENT THROUGH SCIENCE**

Integrating science into art museums provides an enhanced experience and stronger engagement for the public. Projects and exhibitions like *Operation Night Watch* and *Mission Masterpiece* that reveal behind-the-scenes processes bridge the gap between visitors and scientific research of the collection. The innovative research of *Operation Night Watch* draws global attention, while *Mission Masterpiece* is expanding its reach to new audiences, reshaping perceptions of the museum. For both projects, consistently communicating the essence of the information has proven to be important. These initiatives highlight science’s potential to enhance public understanding and engagement with art.

*Katrien Keune is head of the Science Department at the Rijksmuseum and professor of molecular spectroscopy at the University of Amsterdam. Irma de Vries is a senior educator at the Rijksmuseum.*



**Mission Masterpiece**, a temporary Rijksmuseum exhibition presented in 2023 focusing on conservation and science. The interactive exhibition aimed to immerse children in the role of scientists, encouraging them to investigate various objects and use the same methods and techniques employed by museum experts. Photo: Rijksmuseum/Olivier Middendorp.

1. <https://www.rijksmuseum.nl/en/stories/operation-night-watch>

2. <https://www.rijksmuseum.nl/en/whats-on/exhibitions/past/mission-masterpiece>

# CREATIVITY AND CURIOSITY

## A Conversation about the Connections between Art and Science

**MARU GARCIA** is a Mexican artist based in Los Angeles. Her work explores biosystems, multispecies relationships, and the capacity of living organisms (including humans) to act as remediators in contaminated sites. She holds an MFA in design and media arts from UCLA, as well as an MS in biotechnology and a BS in chemistry, both from Tecnológico de Monterrey, México. Her work is included in the PST ART exhibition *Sinks: Places We Call Home*, to be held at Self Help Graphics & Art, presented at Luckman Gallery at Cal State LA.

**LIA HALLORAN** grew up in the San Francisco Bay Area city of Pacifica. She received her BFA from UCLA and her MFA in printmaking from Yale University. Halloran's work investigates how perception, time, and scale inform the desire for humans to understand the world around them. At Chapman University in Orange, California, she is chair of the art department and associate professor of art. Her work will be shown in the PST ART exhibition *Crossing Over: Art and Science at Caltech, 1920–2020* at Caltech and in a solo exhibit at Luis De Jesus Los Angeles, included in the Participating Gallery Program.

**SARAH ROSALENA** is a Los Angeles–based interdisciplinary artist working between handicraft traditions and emerging technologies in media such as textiles, beadwork, and clay. She is assistant professor of art in computational craft and haptic media at UC Santa Barbara. Her work is included in the PST ART exhibitions *From the Ground Up: Nurturing Diversity in Hostile Environments* at the Armory Center for the Arts; *Breath(e): Toward Climate and Social Justice* at the Hammer Museum; *Invisibility: Powers and Perils* at Oxy Arts; and *Sangre de Nopal/Blood of the Nopal* at the Museum of Contemporary Art Santa Barbara.

They spoke with **TOM LEARNER**, head of GCI Science, and **JEFFREY LEVIN**, editor of *Conservation Perspectives*, *The GCI Newsletter*.

**JEFFREY LEVIN** All three of you have works in upcoming exhibitions that are part of PST ART: *Art & Science Collide*. Could you each talk briefly about those shows and how science relates to the work?

**SARAH ROSALENA** These exhibitions are important not only for the history of Los Angeles, but because they're reexamining science and knowledge beyond Western ideologies. My work materializes digital simulation—a computer's imitative representation based on the real world. I use digital tools to make textiles, ceramics, and basketry based on Indigenous and Wixárika forms to suggest new possibilities as we attempt to define ourselves with respect to innovation and technology. The exhibitions I'm involved in reflect on geopolitical effects of climate change and extractive industries to imagine futures beyond these logics. They also involve the rise of artificial intelligence, the unknowingness of what's real and unreal, and the things that are blurring those distinctions and loosening the boundaries and the binaries defined by imperial science and empirical knowledge. I'm interested in new, hybrid ways of making objects in order to generate new forms that reveal new knowledges and new cosmologies—as well as in uplifting Indigenous technology.

**LIA HALLORAN** As part of an exhibition at Caltech, I'm making a large-scale piece on the notion of scale in the section of the exhibition that's inspired by the Charles and Ray Eames film *Powers of Ten*. The piece is called *You, Me and Infinity*, and it'll be a ten-foot-by-twenty-five-foot cyanotype. It's going to involve different symbols of the sun and different relationships of the body. I love this notion—just like the Eames film—that the way that you understand these really large and small scales is through the body. I've also been very interested in the history of Caltech and the Jet Propulsion Laboratory [JPL] and the notion of accessibility. As part of that, I've been looking at the different ways in which women were included or excluded from the history of the Mount Wilson Observatory. There's a fascinating moment that happens at the turn of the twentieth century where women are given great accessibility when solar eclipses occurred. Because solar eclipses happen in various locations on Earth, you don't need access to observatories or scientific equipment to see one.

**MARU GARCIA** I'm participating in two exhibitions, and the main one is an opportunity to work with the Latino community on research currently happening in East Los Angeles. It's





**Maru Garcia.** Photo: Yogan Muller.



**Prospering backyards (2024)** is a collaborative research project founded by Garcia that uses the power of art, science, and community to address the severe lead contamination in the soil in areas of East Los Angeles. In the photo at left, Christine Eyer, a project volunteer, samples a backyard for lead; in the photo at right, Lupe Valdovinos, a community scientist and neighbor affected by lead in her backyard, tests the application of the project's remediation methods. Photos: Courtesy of Maru Garcia.

an art piece and scientific research at the same time. Working with community scientists, Self Help Graphics, and the Natural History Museum, we're trying to develop an alternative method for reducing lead exposure in people's backyards. We've worked with families implementing the use of naturally occurring minerals called zeolites that have the capacity to encapsulate lead. People have dispersed these zeolites in their backyards with mulch and compost, and throughout this past year we've taken samples to analyze how the lead behaves. We developed a method at the Natural History Museum that basically pulverizes the soil, then passes it through a pressing machine that creates these pellets, which we use for analysis. But we're also using the pellets for the exhibition, making some mosaic pieces out of them, as well using the same zeolite material to create what I call "remediating sculptures."

**TOM LEARNER** The subtitle for PST ART is *Art & Science Collide*. How do you each see that intersection? Do art and science actually *collide*? Or do you see it in a different way?

**ROSALENA** What's at the root of both is essentially epistemology. It's how we know things. When you think of science, it's very quantitative. It's numbers. It's names. It's classifications. And then you have art, which is much more qualitative. It's cultural. It's storytelling. When you combine them, you can get a sharper vision into things that we don't necessarily understand. And that's where we are at this moment. We have climate change happening simultaneously with all these new ways that we're learning based on the rapid rise of technology. We're evaluating multiple things on the table because humanity is, in many ways, potentially at stake. I think by letting things fall apart, and by letting things be in juxtaposition, we can build new ways of making and new ways of knowing. There's so much space to think about hybrids because they can cross boundaries. They can change. They can evolve. What

happens when you hold these binaries together—art, science, past, and future—or when you tear them apart, you create something new. That's where interesting things can happen.

**HALLORAN** There's an increasing interest in understanding the experience of science. As we go further into technical development, it's so important to also think about how to connect those developments to our communities. There're so many exciting things that are happening. People want to be included and taken along on this journey. But those technical aspects may be outside the realm of accessibility for many people. This is where art does an incredible job of creating experience and the invitation to participate and to get curiosity ignited—and to have a dialogue with scientific communities. One thing that continually interests me is the undeniable connection of science to nature. There's no doubt that all of us feel that nature is ours. Like going on a hike, watching a sunset, or looking at a river. These all feel like they're ours. But somehow when we get to science, suddenly there's a kind of shut-down, and we don't feel that it's ours. Art can create an inclusive experience that sometimes science doesn't do as well.

**LEVIN** So, what you're providing with some of your work is a portal into, say, astrophysics.

**HALLORAN** Right.

**LEVIN** And, Maru, is your work trying to make accessible biology and chemistry, in part through the projects that have remediation of toxic soil?

**GARCIA** Yes, definitely. Accessibility is a very important part of this commission dealing with lead exposure. I see this happening in the project, collaborating with community scientists. It's giving

people the ability to better understand what is happening in their own backyards. A lot of feelings come through that, and we have the capacity to work with those emotions. In this case, there are some feelings of regret—like, “I allowed my child to play in this backyard.” And even feelings of anger against who has been complicit in this hazardous lead pollution caused primarily by the former Exide battery recycling plant in Vernon.

For me, art and science are combined. That’s been a personal journey for me. I’m trained as a scientist, with a background in chemistry and biotechnology, so I value the scientific method. But at the same time, I’ve always felt a bit constrained. Now, bringing in art is allowing me to integrate my interests as a whole person. When I was in the lab, I had to suppress my emotions and put myself outside of the experiment, because that’s what you must do to be objective. The Western way of looking at things is very compartmentalized, and I feel we need to go beyond that. If we want to study something, we tend to isolate it without considering that everything is in relationship to everything else. I no longer feel that I can just observe things within those parameters. My work has become more fulfilling for myself, and I feel it’s an opportunity for integration of art and science for others too.

**LEARNER** Do you see advances being made in education, where schools are breaking down these boundaries and recognizing the benefits of better integration?

**GARCIA** We’re definitely seeing advances. I studied science years ago, and that didn’t happen for me. But now the approach to education is more problem based instead of just saying in an explanatory way, “This is chemistry,” or “This is mathematics.”

**HALLORAN** When I think of the education that would have been particularly impactful, it would’ve been courses that were more interdisciplinary. Today we’re consumers of an interdisciplinary culture. As chair of the art department at Chapman University, I’ve developed several courses that cross the traditional boundaries, such as The Intersection of Art and Science, where we pair with JPL for visits to fuel student subject matter, and my students spend a night at Mount Wilson Observatory looking through the historic sixty-inch telescope. They make work while interacting with scientists. When they first visit JPL, it’s exciting and awe-inspiring, but there is a subtle sense of “I’m not worthy.” By the end of the semester, they recognize this concept of problem-solving. Yes, the outcomes of science and art are extremely different, but if you’re a young sculpture student, you’re problem-solving with new materials or new ways of working. How is that so much different conceptually than trying to put a robot on a place we’ve never gone to with an atmosphere we’ve never encountered? They share the common language of creativity and problem-solving. For me this integration is what’s most exciting. So why can’t we create either communication or experiences through art and projects that invite a wider audience to that discussion for meaningful contributions?

**ROSALENA** I teach a course on art and science technology that’s highly conceptual because their essence is really about concepts. It is very creative, and it makes tools from different perspectives. Tools can be very manipulative and shape us because they are performative. Science can also be very performative. I’m interested in how the arts bring people together to create new things. I’m drawn to innovation in this way. Our current problems are very complex and require us, for example, to decenter the human and focus on non-human species, nonhuman intelligence, and the environment. It’s not only important to look toward the future, but also to reflect on the past and the oppressive technologies that have shaped the way we understand things, and to create beyond these logics.

**LEVIN** We’ve used the word integration, but isn’t it really *reintegration*? Go back a couple hundred years, and there weren’t these kinds of separations. What is paint, but chemistry? What is clay, but materials science? Would you say that in your work you’re trying to *reintegrate* as opposed to integrate?

**GARCIA** I would say yes.

**HALLORAN** Each of our personal histories probably leads us to understand that we’re bringing together something that was always integrated. My first job when I was fifteen years old was at a science museum, the Exploratorium, doing cow-eye dissections and laser demonstrations. I ended up working in the machine shop where the attitude was, “Let’s make an exhibit and explore something.” You felt like you were in a laboratory. That set my trajectory as an artist—being insatiably curious, trying to challenge the notion of materiality, and wanting to deeply engage in some sort of discovery or understanding of nature. It really comes from a joy of curiosity. What you’re talking about is going back to the Renaissance. I think we can all go back to our childhoods. When you’re five years old, are you a scientist or are you an artist? My six-year-old will tell you she’s a physicist *and* an artist. And she’s not wrong, right? It’s just tapping back into how we explore and understand the natural world.

**GARCIA** Yes, there is that connection. For me, science and art share the idea of process—they both must go through a process. Sometimes there’s an objective. They’re pursuing something. But I love when there is this openness of, “What can we find?” Both can have the same capability of just exploring because exploring is fun.

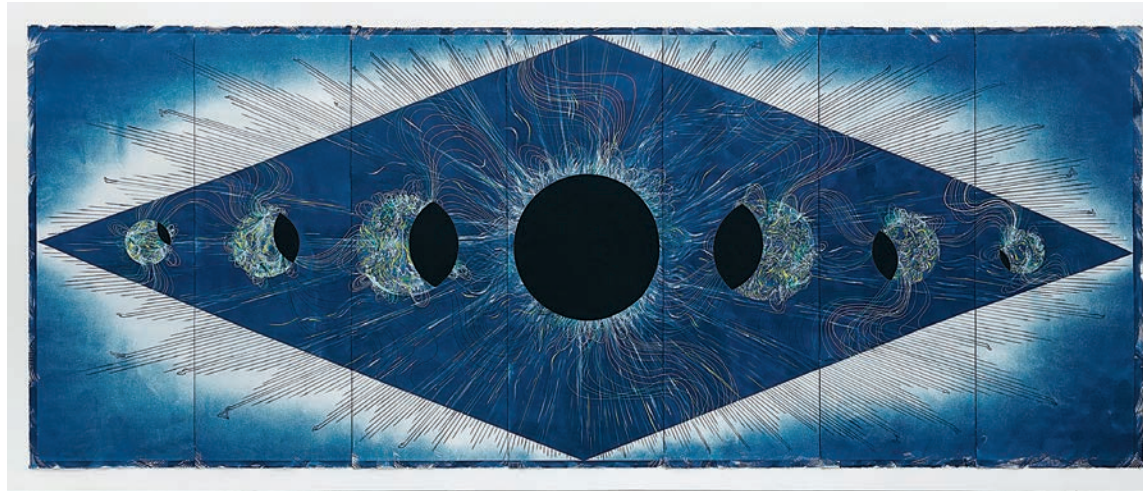
**ROSALENA** Well, it is critical. Conceptualization is problem-solving. For example, I see craft as problem-solving. You have traditions of generative processes done by hand, and now you can collaborate with machines. But what does it mean to use both hands and machines? It’s breaking these binaries, human and non-human, for problem-solving. It’s very abstract, and there is play and research in the abstraction.

**LEARNER** You’ve all touched on this already, but could you expand on what art can do that science struggles with?





Lia Halloran. Photo: Adam Ottke.



*The Sun Burns My Eyes Like Moons* (2021), by Lia Halloran. Cyanotype on paper from painted negative with acrylic and ink; 9 ft. 11 in. x 25 ft. (3 x 7.6 m). Photo: Paul Salvesson.

**GARCIA** I think there's this openness in art. I'm not saying that scientists are close-minded. But there is an openness in terms of the ideas that you can explore in art that don't have to be compartmentalized. And there is the possibility of bringing yourself into the exploration. That's what happened to me. Art allows you to make things accessible to a broader public on a shared human level. I also think that art is posing new questions that may expand science, like, "I need to do this—for example, a sculpture that has the capacity to remediate soil. Can you design the technology? Or can you develop the science to make it work at scale?"

**HALLORAN** There's this notion that science has all the answers, whether we're looking outward to the universe or at our own bodies. You go to the doctor, and you want them to explain to you, definitively, what is happening. One of the things about science is its ability to say, "We know this far but we don't know further than that." This is especially true with new discoveries of the very small and the very large parts of the universe. There's so much that art can do to ask questions that science can't answer. Art does something impactful by offering questions about the unseen or the unknowable. It engages more of our senses and more of our bodies and more of our personal narratives. It's much more inclusive and diverse. Once we understand that science isn't totally objective and doesn't have all the answers, art can contribute by having a dialogue with that. That's where things get really exciting.

**LEVIN** I also think that art is more comfortable with the unknown.

**HALLORAN** Yes.

**GARCIA** Exactly.

**ROSALENA** Yes. And art is what makes us human. It's the fundamental thing that defines us. It drives us to change things and to innovate. It's the embodied heritage we have from our ancestors

and that we all share. It's constantly challenging the way that we perceive the world. So much of how we change the way that we see is through art making. It challenges the realities that surround us.

**LEARNER** Considering one of the most pressing issues of the day—how we are dealing with climate change—science has produced so much evidence of it, and yet the world remains divided on whether it's real or not. I don't think gathering even more scientific data is going to change many opinions now. But do you think that art or some other approach can help advance an understanding of the reality?

**HALLORAN** There's a Neil deGrasse Tyson quote that I love. He says, "The good thing about science is that it's true whether or not you believe in it." We're at a weird moment where we're politicizing science. With climate change, we're looking at things that have been proven by multiple people around the globe. I'm highly concerned, as we all are, that science is being used as a divisive tool, and that there's this notion that science doesn't help push our society forward. I absolutely agree that the more we know, the more overwhelming it can sometimes get. What art can offer to the human experience is a way to cope with information and to cope with our part in what is happening around us.

**ROSALENA** Yes, art can open people up to different perspectives. Climate change is geopolitical and is affecting certain people more than others. I feel that it creates this space for, and pressure for, social change and social justice. Parts of climate change are visible, and parts are invisible. Machines can render data and sea levels visible. But what's invisible are the people being displaced and the animals that are going extinct—which is happening every minute. Art can really bring in a perspective on that.

**LEARNER** Let me ask about conservation. How do each of you navigate the concept of preserving the art you're creating, for the future?

**ROSALENA** I work with a variety of materials, from research I did with NASA JPL, to foraged native plants for weaving, to Indigenous materials such as cochineal. A lot of these are temporal and have evolved over time. I love seeing them as living entities—like how a cochineal insect can create colors that shift from intense deep reds, purples, and orange to pink. It’s me collaborating with other species and working with the earth. I was taught that when you weave a textile and you cut it off, it’s the umbilical cord. It’s an extension of you. And there’s a lot of superstition around, for example, pottery. If you were to break a pot, you would bury it back in the earth because that’s where it comes from. Yes, it’s an object, but it’s also of the earth. Of course, preservation of the work is very important, but so is the process of making it and the knowledge building that comes from these interactions.

**GARCIA** When I think about conservation and preservation, I think about the things that I was avoiding when I was in the lab. Namely, bacterial contamination. We had to clean everything because you had to avoid every single contaminant. Now it’s the opposite. I collaborate with those microorganisms, for example, with my kombucha pieces. I make pieces that make peace with the bacteria and their natural degradation process. So, yes, some of my work is not meant to be preserved because it decomposes. It’s meant to continue its time in nature and just be. Even the remediating sculptures that I’m working on for PST ART have an objective of reducing lead through disintegration in the soil. They must be exposed to the environment, so that remediation may happen. I embrace the idea that we are in this planet and that there is a time for everything. Things eventually have to decay and come to an end.

**HALLORAN** When I wanted to create work about stars and the sun, it was a conceptual decision to start making cyanotypes. I had no background working with cyanotypes, but I loved the notion of making work about the sun that would use the sun in the process of creating the work. After a cyanotype is exposed, the print is a vibrant blue, but if you leave it in the sun, the color will fade away. I like that my work is in this precarious moment of time. I’ve tried to understand how to make my work as stable as possible. But for me, more than the final product, is the concept and the process of what I’m making that links it to the subject matter.

**LEARNER** Do each of you consciously try to make your intent known to those charged with preserving your work—and if so, how?

**HALLORAN** I hope that someone has a moment where they feel excited about what they’re seeing, and that it is perceived as an invitation for them to know more. But that is not the point of the piece. All of my work is materially decided by the concept itself. It’s not my point to be didactic or teach you anything, but that you look at, say, a large-scale cyanotype, and you have a feeling like, “What is this?” I love the feeling of standing in front of a large-scale cyanotype because it simultaneously has this luminosity but also offers a sense of the vastness of the universe. Instead of telling you something, I’m inviting you to ask a question. And go from there.

**LEVIN** But the question is—do you want someone to be invited to ask those questions fifty years from now with your work? Or doesn’t that matter?

**HALLORAN** It absolutely matters in terms of conservation. With Maru’s piece, it’s *meant* to disintegrate. That to me is so exciting. It’s part of the process. So, whether you encounter it now or in fifty years, you’re actually a participant in a time frame. That is the concept. With my work, say the cyanotype pieces, I’ve done enough research to understand what the stable chemicals are and how to preserve the pieces to a certain point. But I also love the idea that you’re experiencing it as a moment in time.

**ROSALENA** Well, the process and the conservation of the material are very important in my practice. Materials science makes the work visible, but the work also speaks to time and history. To go back to simulation, what I’m doing is reimagining things on a computer based at the smallest scale, the pixel—the smallest physical point that you can manipulate something in the physical world. The single pixel or 3D point opens us up to thinking beyond render or resolution. It allows space for things to come through. Or when you 3D-scan an object, a point becomes a material, tangible thing—which then can be shared in an archive or put in virtual reality or augmented reality. There’re so many ways to think about conservation now. I’m really interested in how conservation’s going to expand with the advancement of digital technology.

**LEARNER** Sarah, you come from a long line of women engaged in the tradition of weaving. Now you’re taking it into the AI/digital world, and yet you still manage to keep the traditional aspects going. How do you balance that, and how might that look in the future?

**ROSALENA** I have very traditional looms, some I inherited from my grandmother and my mother. But I predominantly weave on a digital Jacquard. For me, it’s about reexamining and breaking apart digital imaging, like AI. I started working with AI around 2017, which was very different than today. It required coding experience to build a model and dataset, which takes a tremendous amount of time and skill. Now AI is very accessible, but operates very differently. Prior to ChatGPT and Midjourney, you needed to make a dataset from many images. At the time, I was using satellite images from NASA, such as the Mars Reconnaissance Orbiter that has been documenting Mars since 2006. I was interested how AI could create worlds, much of it being trained from Earth images, and how I could use it to render anticolonial landscapes “alien” to scientific visualizations. For me, AI created this planetary glitch through weaving as resistance. Many people don’t know that the origin of computers comes from the Jacquard loom, textile production, and punch cards, which also have stories of resistance. I love the story of the word *sabotage*. When Jacquard looms came out [in the nineteenth century], textile workers were scared that they were going to lose their jobs, so they would grab their wooden clogs, *sabots*, and throw them into the looms to jam





**Sarah Rosalena.** Photo: Alan Mendez.



**Spiral Arm Red** (2023), by Sarah Rosalena. Hand-dyed cochineal wool yarn, cotton yarn; 33 x 41 in. (83.8 x 104.1 cm). Photo: Ruben Diaz.

them. Hence, “sabotage.” It’s, “How can I throw my wooden shoe, and rage against the machine?”

**LEARNER** A big issue the conservation field faces—with contemporary art in particular—is how far to go in protecting an artwork from aging. In extreme cases, it can feel like an obsession to not accept any blemish or alteration with time. But often a piece’s relevance is so strongly linked to the specific moment it was created, that it doesn’t make sense to put the effort into keeping it pristine. Allowing natural degradation to occur might be more appropriate. But then again, certain pieces might have a renewed relevance in the future. It happens all the time, and you often can’t predict it. What do you consider an appropriate way to balance the materials and concept in your work?

**HALLORAN** Not to be dismissive of conservation efforts, but for me the paramount goal of my work is to have a dialogue between the material and the concept. What happens to that in the future is predetermined by these two things that are already in dialogue. It’s more important to me to be making something. I love this notion that this piece that I’m making now on the sun, I can’t make in winter because of the Earth’s location around the sun. I’m dependent on astronomy to make a piece about astronomy. I’ve gone as far as I can to try to make my work stable, but it’s secondary to the marriage of concept and materials.

**GARCIA** I feel I collaborate with time, too. That’s another of my collaborators. Part of my process is that I sometimes test something as an experiment and then I come back three hours later and think, “Oh, maybe I should develop *this* idea.” And then I come back one week later and say, “Oh, I’ll develop *that* instead.” That’s what I want to happen in my pieces. I want evolution to

unfold. I don’t want them to be static. And even the most conserved art piece is not static. Everything is changing. They have microbes living in them. There is something happening even if you cannot see it.

**LEARNER** Another discussion in the field is who decides what conservation approach is appropriate, and who carries it out? The conservator? The artist? The owner? The relevant community? The traditional notion of relying almost solely on the conservator is being challenged, and there’s broad acceptance now that most decisions about conserving artworks benefit from engaging a broad group of stakeholders, and considering material and intangible aspects, as well as utilizing a range of documentation. What are your views on that?

**ROSALENA** It’s a testament to how rapidly art, media, and technology are evolving. It’s much more complex every day. It’s the inclusion of digital archives. Digital conservation is another way we can talk about repatriation—having the ability to 3D-scan and archive a 3D model of a collected object, and letting the physical objects go back to their communities. It’s about *rematriation*. Institutions can support works made from biodegradable materials. It’s important for artists to continue to make work that challenges materials beyond its lifespan. That’s what I do with my students—challenge them to make work from discarded or found natural materials versus going to an art store. There’s a rise in people wanting to use found materials. It’s a reflection of our time that we’re just bombarded with an excess of materials. If we can reimagine using stuff that’s been discarded, we create a space for artists. A space for making new things. But as a reflection of us.



# RESOURCES | ART & SCIENCE

## ONLINE RESOURCES

Heritage Science

<https://heritagesciencejournal.springeropen.com/>

An open access journal publishing original peer-reviewed research

Leonardo

<https://leonardo.info/>

An online and print journal that fosters transformation at the nexus of art, science, and technology

The National Gallery Technical Bulletin

<https://www.nationalgallery.org.uk/research/research-resources/technical-bulletin>

An annual publication focused on the study of the materials and techniques of painting, and the scientific examination of paintings

PST ART: Art & Science Collide

<https://pst.art/>

A Getty initiative involving exhibitions throughout Southern California in 2024 that explore the intersections of art and science

SciArt Initiative

[www.sciartinitiative.org/](http://www.sciartinitiative.org/)

An initiative that encourages and supports science-art interactions globally via a variety of programs

## BOOKS

*Color Science and the Visual Arts: A Guide for Conservators, Curators, and the Curious* by Roy S. Berns (2016). Los Angeles: Getty Conservation Institute.

*Crocheting Adventures with Hyperbolic Planes: Tactile Mathematics, Art and Craft for All to Explore* by Daina Taimana (2018). Boca Raton, FL: CRC Press.

Cultural Heritage Science.

An "interdisciplinary book series covering all aspects of conservation, analysis, and interpretation of artworks, objects, and materials from our collective cultural heritage." Switzerland: Springer.  
<https://www.springer.com/series/13104>

*The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* by Martin Kemp (1990). New Haven, CT: Yale University Press.



**A cross section photomicrograph of paint layers** from a graffiti-covered wall in Venice Beach, California. The full cross section includes over 300 individual paint layers. Image: Arlen Heginbotham, J. Paul Getty Museum.

*Seen | Unseen: Art, Science, and Intuition from Leonardo to the Hubble Telescope* by Martin Kemp (2006). Oxford, UK: Oxford University Press.

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"Artists on Science: Scientists on Art"

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by Ken Shulman, in *MIT News* (October 5, 2023).

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by Marta Wiktoria Bryll, in *Daily Art Magazine* (March 14, 2024).

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"Terra Incognita: Exhibiting Ice in the Anthropocene" by Julie H. Reiss, in *Art, Theory and Practice in the Anthropocene*, edited by Julie H. Reiss (2019). Delaware: Vernon Press, 77–86.

"Women's Agency in Art and Science" by Dalila Honorato and Claudia Westermann, in *Technoetic Arts: A Journal of Speculative Research* 21, no. 2 (2023), 151–56.

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# GCI News

## Project Updates

### GUIDELINES FOR GROTTO SITES IN GANSU PROVINCE

For thirty-five years the Getty Conservation Institute has been productively engaged in collaborative work in China, ranging from national-level undertakings, such as development of guidelines for conservation and management of heritage sites (the China Principles), to site-specific projects with wide application, such as wall painting conservation and visitor capacity methodologies, among many other projects and endeavors. These undertakings have largely focused on the ancient Buddhist site the Mogao Grottoes, in partnership with the Dunhuang Academy (DA). An outgrowth of this long partnership was the award-winning 2016 Getty Center exhibition *Cave Temples of Dunhuang: Buddhist Art on China's Silk Road*.

In 2016, because of the DA's leadership in conservation and management, three large grotto sites in Gansu Province were placed under the academy's management, two of which—Maijishan and Binglingsi—have World Heritage status as part of the transnational World Heritage nomination *Silk Roads: the Routes Network of Chang'an-Tianshan Corridor*, necessitating a more regional conservation and



Scientists and conservators from the GCI, the Jerzy Haber Institute, and the Victoria and Albert Museum (V&A) discuss the placement of acoustic emission sensors in a V&A gallery. Photo: Ashley Freeman, GCI.

management approach. To help meet this need, the GCI and DA organized a training course on the China Principles for managers of national-level protected sites in Gansu, out of which grew the idea to address holistically the many ancient Buddhist grotto sites in the province. With the support of the Gansu Provincial Cultural Heritage Bureau, and after research and study trips to the sites, the partners developed a set of operational guidelines for conservation and management of grotto sites, an adaptation of the China Principles to a specific heritage type prevalent on the Silk Road.

These grotto sites—128 of which are protected at national, provincial, or county level—have faced many of the same challenges as the Mogao Grottoes. Yet it has been easy to overlook the less significant sites, which are nevertheless the more numerous and have close relationship with their nearby communities. Most grotto sites are in places of natural beauty in environments that, while harsh, are representative of the deep past of the Silk Road. They exemplify the full range of grotto types constructed over the thousand years that Buddhism flourished in China. From this perspective, their neglect following the decline of the Silk Road during the Ming Dynasty—when many sites fell into disuse and suffered deterioration and exploitation from various natural and

human causes—represents a significant loss to the historical record.

Despite a three-year hiatus (2020–22) during COVID that prevented travel, collaboration continued; the guidelines were completed in 2023 and given a final review in a colloquium for Chinese professionals hosted by the DA in September 2023. They will undergo a final text and design edit, and then will be printed in China by the DA later in 2024. We are confident that with diligent application, the Guidelines will contribute to preserving the artistic, historic, scientific, and social values of Gansu's grotto sites and may serve as a model in other provinces.

### CLIMATE MANAGEMENT STRATEGIES WORKSHOP

Prompted by an interest in the behavior of museum collections in spaces with broad environmental parameters and seeking to understand acclimatization and the concept of “proofed fluctuation,” the GCI's Managing Collection Environments Initiative (MCE), the Victoria and Albert Museum (V&A) in London, and the Jerzy Haber Institute of the Polish Academy of Sciences initiated a collaborative project to assess climatic impact on a collection of wooden furniture in V&A galleries. A yearlong monitoring program is employing acoustic emission to track microcracking in a

selected piece of furniture, and digital speckle pattern interferometry is used to characterize possible surface damage in selected objects. Both conserved and nonconserved furniture long displayed in museum galleries will be analyzed. The aim is to provide insights into object sensitivity to broader temperature and relative humidity variations, ultimately helping to shape more sustainable operational and environmental management strategies.

As part of this project—and to underscore the commitment to advancing sustainable conservation practices—MCE and the V&A organized the Changing Climate Management Strategies: Sustainable Collection Environments and Monitoring Object Response workshop. Held February 5–9, 2024, the workshop convened leading experts and professionals in the field.

The heritage field has recently shifted away from prescriptive narrow ranges of temperature and relative humidity and toward adoption of broader environmental parameters suitable for numerous classes of objects. However, many institutions are reluctant to adopt these wider parameters because of a lack of evidence-based risk analysis for climate-induced damage and limited expertise on the sustainable management of the collection environment.

The workshop sought to foster dialogue about sustainable collection environments. The thirty-eight participants represented heritage institutions in Bosnia and Herzegovina, Cameroon, Denmark, Egypt, France, Germany, Greece, Jordan, Lebanon, the Netherlands, Norway, Poland, Qatar, Scotland, Spain, Sweden, Tanzania, the United Arab Emirates, the United Kingdom, and the United States. The diverse array of participants (nearly half of them emerging professionals) included conservators, facilities managers, registrars, scientists, curators, and architects, thus ensuring a rich exchange of knowledge and perspectives.

The workshop initially focused on the changing environmental and political contexts in which museums operate, including sessions on environmental guidance and government regulation and a discussion on decision-making under uncertainty, followed by considerations of object damage, change, and value during walk-throughs of the V&A galleries. Subsequent days examined life cycle assessments, risk assessments, environmental monitoring, and data analysis. Also covered were the monitoring of environmentally induced object response, existing tools for environmental data analysis, and mechanical and nonmechanical strategies

for environmental management. The workshop also featured presentations of case studies of cultural heritage institutions striving to balance collection preservation and environmental sustainability.

The GCI is organizing the next iteration of this workshop, which will be held in Los Angeles in 2025.

## ARCHES PROJECT UPDATE

The past year was highly productive for the Arches Project, the Arches open-source data management platform developed for the cultural heritage field by the GCI. Arches is free for organizations worldwide to install, configure, and extend in accordance with their individual needs and without restrictions on its use.

There was considerable growth of the Arches international community and significant progress in software development. The launch of versions 7.3, 7.4, and 7.5 brought important enhancements, notably the integration of international accessibility standards, made possible through collaboration with Historic England. Additionally, these versions included advanced features for bulk data loading and editing, streamlined workflows, and various upgrades and refinements. Other highlights include release of Arches for Science v1.0 and major progress in development of the new Reference Data Manager (known as Lingo) for managing controlled vocabularies. The Arches community has matched this activity with code contributions, published papers, webinars and user-group meetings, presentation of Arches-related topics at conferences, and an Arches software developer meetup with over twenty international attendees, which was held at the Getty Center in March.

There were several new Arches implementations during 2023. One notable participant is SF Cultural Heritage, which supports data management for the San Francisco Citywide Cultural Resources Survey. This accessible and interactive public website highlights the interconnections of San Francisco's cultural heritage and shares SF Survey findings. The site serves as San Francisco's ongoing cultural resources inventory, allowing for future additions and changes as new information is aggregated. SF Cultural Heritage is the result of a collaboration between the San Francisco Planning Department and the GCI, with Farallon Geographics acting as the IT service provider. Other community members planning to publicly launch Arches deployments in 2024 include the Auckland Council, the Greater

London Historic Environment Record, and the British Columbia Register of Historic Places.

Following consultations with its open-source governance adviser, the GCI, as founder and sponsor of the Arches Project, will continue to serve as its institutional home. This was decided after considering the pros and cons of instead creating an independent nonprofit for Arches, and it reflects the GCI's continued commitment to the long-term sustainability of the platform. The GCI is also continuing work with the Arches Advisory Planning Group to create an interim governance body to represent a variety of stakeholders as a first step in transitioning to a more community-governed and sustainable open-source project. Ultimately, the GCI's goal for the Arches Project is to have a self-sustaining open-source community comprising a rich variety of institutions working collaboratively for the benefit of the international heritage field.

## AMÉRICA TROPICAL PROJECT

The longstanding collaborative project between the Getty Conservation Institute and El Pueblo de Los Angeles Historical Monument, City of Los Angeles, to conserve, protect, present, and interpret the mural *América Tropical* by David Alfaro Siqueiros is now completed. This follows the conservation of the mural, the construction of a protective shelter and viewing platform, the design and installation of an interpretive center, and a ten-year period of monitoring and maintenance.

Painted in 1932 on the exterior second story of the Italian Hall in downtown Los Angeles using an experimental fresco technique on cement plaster, the mural measures eighty-four by eighteen feet. It depicts an overgrown jungle landscape with pre-Columbian ruins, a centrally placed Indigenous figure on a double cross surmounted by an American eagle, and, in the upper east corner, two revolutionaries taking aim at the eagle. The mural's controversial messaging looming above the newly opened tourist attraction of Olvera Street led to its whitewashing over the next decade, where it languished and was nearly forgotten.

Over time, the mural began to deteriorate because of the flawed experimental technique, the eventual flaking and wear of the whitewashing, and neglect. In the 1960s, there were grassroots efforts to preserve the mural, and in 1988 the GCI and the City of Los Angeles through El Pueblo de Los Angeles Historical Monument entered into an agreement to conserve, protect, present, and interpret it. Since





**The América Tropical mural** in downtown Los Angeles. Photo: Anna Flavin, GCI.

then, GCI scientists have carried out environmental monitoring and scientific analysis of the mural, which was then stabilized and conserved by a team of GCI conservators and consultant mural conservators. In turn, the City of Los Angeles designed, constructed, and installed a shelter, viewing platform, and interpretive center through its Bureau of Engineering and El Pueblo de Los Angeles Historical Monument.

Construction and conservation were completed in 2012. In the years following, the partners developed a monitoring plan and maintenance program along with capacity building and training to ensure the long-term preservation of the mural and the site. A ten-year period of monitoring and maintenance has ended, and the GCI has now transferred the responsibility for the long-term care of the mural and the site to El Pueblo de Los Angeles Historical Monument.

## **EARTHEN ARCHITECTURE EXPERTS MEETING**

In December 2023 the Getty Conservation Institute brought together thirty international experts for a four-day meeting to discuss the conservation of earthen heritage. Organized by the GCI's Earthen Architecture Initiative under the aegis of the ICOMOS International Scientific Committee on Earthen Architectural Heritage (ISCEAH), the meeting aimed to define common strategic directions in the field of earthen heritage conservation, develop

thoughtful responses to current challenges, and foster mutual exchange and learning among conservation professionals.

The meeting was organized around five key themes in the field, including analysis of earthen materials, education and capacity building, adaptive reuse, climate change, and preventive conservation. The gathering began with the GCI sharing research on heritage conservation trends through analysis of the Terra conference proceedings, discussing the condition of World Heritage Sites made of earth, and presenting the results of a survey of over five hundred professionals working in earthen heritage conservation.

During the meeting, participants were involved in interactive workshop activities, identifying needs and goals for the field, as well as showcasing their own earthen architecture projects and discussing both challenges and successes in their work. The meeting concluded with participants defining future activities and outputs to advance the field of earthen heritage conservation.

The results of the meeting will be compiled into a summary publication and disseminated online to provide a reference for the field, while also informing the GCI's ten-year strategy for the conservation of earthen heritage.

## **AATA EDITORS UPDATE**

Last fall, Ruth Norton, former Chief Conservator at the Field Museum in Chicago and AATA Online Field Editor, retired from AATA Online after nineteen years of service. In her role as

Field Editor, she served as an expert adviser in collections care and preventive conservation, in addition to helping monitor AATA Online's scope of coverage and evaluating abstracts for quality and relevance. We are grateful to have had the opportunity to rely on her professional wisdom over the course of many years, which has helped AATA grow and maintain its viability as an important resource for the field.

James Gleason—preventive conservator at the National Gallery of Art, Washington, DC, and former Andrew W. Mellon Fellow in Objects Conservation—replaced Norton in November 2023. He has been deeply involved in the Materials Working Group of the American Institute for Conservation and has a broad knowledge base in preventive conservation. We are delighted to welcome him to the AATA team.

## **Recent Events**

### **BRONZE PATINATION FOR CONSERVATORS WORKSHOP**

A three-day workshop on the patination of bronze sculpture was held at the Getty Center on October 24–26, 2023, organized by the Getty Conservation Institute and the Getty Museum and developed in collaboration with Andrew Baxter (Bronze et al, Ltd.), an expert in patination and metalworking with decades

of experience working with foundries, artists, and conservators. Baxter was joined as an instructor in the workshop by Julie Wolfe and Robert Price, conservators in the Getty Museum's Decorative Arts and Sculpture Conservation department.

The workshop's objective was to provide sculpture conservators with the knowledge and practical skills necessary to understand the patination process and to re-create patinas on sculptures affected by factors such as human interaction and environmental exposure. With a limited number of solutions and pigments it is possible to create a multitude of colored patinas, which were demonstrated during the workshop.

The workshop's twelve participants were selected from a large pool of applicants and included conservators in private practice, museums, and educational institutions from Australia, Brazil, Chile, Norway, and the United States.

The workshop opened with an explanation of the patina processes and information on foundry work, as well as a discussion of the history of patination and materials used. Emphasis was given to health and safety processes necessary during patination, and to preventive measures. Participants presented case studies showing a variety of patination issues, which was followed by demonstrations of how to achieve different colored patinas. Participants had the opportunity to practice on bronze

plates and learned to balance the application of heat and chemicals.

Subsequent sessions included demonstrations on how to achieve brown, black, and silver patinas, and continued practice by participants testing these additional formulas to create a range of colors and effects on their test bronze plates. The three instructors offered further discussion on strategies for patina replication and restoration, preservation of indoor versus outdoor patinated bronzes, and protective coatings. The workshop concluded with a discussion of the patination processes in which participants offered feedback on their practical experience and brainstormed on possible solutions to their case studies.

### EXPERTS MEETING ON PRESERVATION OF DIGITAL MEDIA

On February 26–27, 2024, more than thirty professionals from four continents gathered at the Getty Center for an experts meeting on sustainable preservation of digital media art. The meeting, organized by Flavia Perugini of the GCI and Cass Fino-Radin, conservator and founder of Small Data Industries, aimed at exploring the preservation challenges of ephemeral digital materials, addressing gaps in knowledge of stakeholders, and identifying accessibility needs globally—all factors affecting sustainability of time-sensitive materials.

Participants—who included time-based media art conservators, professors, digital preservationists, and archivists—discussed their experiences and identified common preservation issues among art collections, archives, digital repositories, and the motion picture industry. A session addressing regional contexts highlighted the state of the field outside the Western world, where access and exposure to techniques, tools, and knowledge necessary for the preservation of digital materials are different.

Training of stakeholders was also discussed. Speakers reported on their experience as educators and on the curricula's changes over the decades to adapt to the ever-changing needs of the field and the qualities of digital media. Renowned artists Rafael Lozano-Hemmer and Refik Anadol presented their work, highlighting their collaborations with their teams, as well as their preservation efforts and communication with collectors and stakeholders.

On the second day participants learned about media art conservation training programs, other educational resources, and current preservation practices. In collaborative sessions, participants detailed the challenges of media preservation and brainstormed on building a practical and accessible self-assessment tool that could help guide individuals and institutions toward effective yet sustainable programs of preservation. Discussions about sustainability brought attention to three needs: to involve all stakeholders at an early stage; to perform comprehensive documentation; and to research risk assessment.

The discussions provided an overview of the fragility of digital media, which is inherently sensitive to time, expertise, and obsolescence, and the importance of understanding its preservation requirements. The results of the discussions will be shared in an upcoming report.

### CHALLENGING THE NARRATIVE SYMPOSIUM

On November 11, 2023, the Getty Conservation Institute and the Haus der Kunst in Munich held the symposium *Challenging the Narrative: Conservation and Replication of Immersive Artworks*.

The symposium—hosted at the Haus der Kunst—focused on immersive artworks created by women artists and known as “environments,” which in the late 1970s were defined as “installations.” Most of these artworks were experimental in nature, site specific, and often destroyed after display. Haus der Kunst and the GCI invited scholars, art historians,



Participants in the Bronze Patination workshop at the Getty Center. Photo: Cassia Davis, Getty Trust Communications.





**Participants in the GCI's Outdoor Painted Sculpture workshop** at the Kröller-Müller Museum in Otterlo, the Netherlands, viewing the walkable outdoor painted sculpture *Jardin d'email* by Jean Dubuffet, 1974. Photo: Ellen Moody, GCI. © Pictoright, Amsterdam.

conservators, and artists to discuss and reflect on the current status of reproduction and replication processes of immersive artworks at institutions in different parts of the world. Eighteen scholars from Argentina, France, Germany, Italy, the Netherlands, Portugal, the United Kingdom, and the United States presented and discussed case studies related to the challenges, benefits, and opportunities of replicating large-scale artworks by female artists, many of whom were crucial to the role of women in art. The discussion included how curatorial approaches to exhibition-making affect museums and the perception of artworks, how we can rebuild lost histories, and research-driven conservation approaches.

The symposium was organized in conjunction with the Haus der Kunst exhibition *Inside Other Spaces: Environments by Women Artists 1956–1976*, curated by Andrea Lissoni and Marina Pugliese. It included three sessions, with three presentations and a moderated panel discussion in each. The first session examined the work of women artists from a feminist perspective. The second session discussed replication of immersive artworks and how they are adapted and replicated in different architectural spaces. The third session explored the work of artists in relation to architecture. Pip Laurenson of University College London provided feedback on the presentations and panel discus-

sions, which was followed by a roundtable that included the panel moderators and the exhibition curators. The symposium closed with a live performance by Tania Mouraud, a prominent artist also featured in the exhibition.

### OUTDOOR PAINTED SCULPTURE WORKSHOP

The 2023 iteration of the GCI's Treatment Strategies for Outdoor Painted Sculpture workshop was held at the Kröller-Müller Museum in Otterlo, the Netherlands, October 16–20, 2023. Eighteen participants from Europe, Asia, and the Americas convened to hear lectures, share case studies, and participate in hands-on activities and discussions about the unique conservation challenges posed by outdoor painted sculpture.

Exposed to harsh environments, any paint applied to outdoor sculpture will inevitably deteriorate and require replacement, typically multiple times over the course of an artwork's life span. Because of the often large scale of these works and the industrial products and methods needed for high-performance paint application, conserving them requires collaboration with stakeholders and professionals with skills complementary to those of conservators. Tools that typically fall outside of traditional conservation training—such as effective communication and project management, as well as

familiarity with the materials and behavior of industrial coatings—are critical to the treatment of these artworks.

The Kröller-Müller's seventy-five-acre sculpture garden provided the backdrop for this workshop, which was taught by a team of conservators with over a hundred years of combined experience with outdoor painted sculpture, as well as an industry paint specialist. Participants were offered practical and theoretical tools to design effective treatment strategies for outdoor painted sculpture, including decision-making strategies, practical skills for local treatment, and methods to extend the time between full repaintings.

## Staff Update

### JEFFREY LEVIN TO RETIRE

After thirty-three years as editor of this publication, Jeffrey Levin will retire from the Getty Conservation Institute on July 1, 2024, bringing to a close his long and productive association with the Institute.

Jeff entered the conservation field well into his professional life as a writer and editor. After earning a history degree at UCLA, he worked for several years in the office of Los Angeles Mayor Tom Bradley, followed by two years as a network television writer. Later he lived in New York City, where he served as a policy analyst on the staff of a New York State economic commission in the office of Governor Mario Cuomo.

Returning to Los Angeles, Jeff was a freelance writer for the Opinion section of the *Los Angeles Times* and a writing consultant for

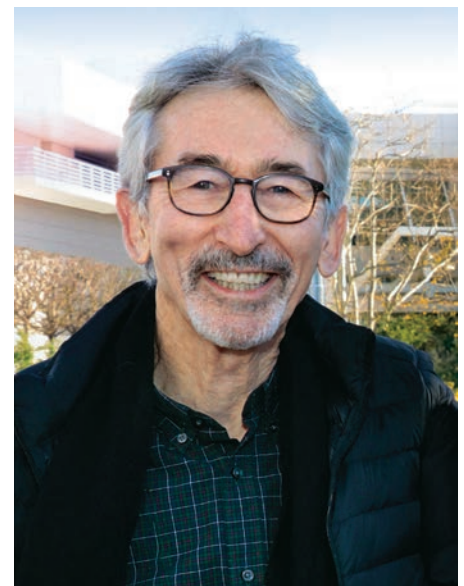


Photo: Anna Flavin, GCI.

the Friends of the Arts of Mexico Foundation, where his projects included the documentary *Ancient Voices: The Rock Art of Baja California*, produced by Televisa in Mexico. He began consulting for the GCI early in 1991 as the freelance editor of what was then called *Conservation*, as well as writing the GCI video *Nefertari: The Search for Eternal Life* and editing the GCI book *Picture L.A.* He joined the Institute as a full-time staff member in October 1995.

The centerpiece of Jeff's work has been the newsletter, now called *Conservation Perspectives*, which has become a place not only for GCI staff but also colleagues around the world to write about their projects and express their ideas. Over the years, Jeff guided the publication through a series of changes in its look and editorial focus, developing and solidifying the thematic approach that it has today. The eighty-two editions of *Conservation Perspectives* published during his tenure constitute a significant and varied body of literature for the conservation field.

Jeff's communications efforts for the Institute extended beyond the newsletter. Working with Alison Dalgity, he was central to the development of the GCI's early websites, the first of which went live in August 1996. A few years later, he began producing a series of videos on GCI projects, making the GCI among the first at Getty to deploy video as an important and regular communications tool. Jeff was also a key member of the curatorial team that organized the award-winning 2016 Getty Center exhibition, *Cave Temples of Dunhuang: Buddhist Art on China's Silk Road*. Working with the Hollywood media firm yU+co, he organized the exhibition's video content and led the development and implementation of the compelling Cave 45 Virtual Immersive Experience, a 3D virtual tour of an eighth-century Tang dynasty cave temple.

In this work and in a variety of other ways, Jeff has been integral to how the GCI has communicated to multiple audiences around the world. Central to his success has been his ability to work collaboratively and collegially with peers and partners here and internationally.

For more than three decades Jeff has served the Institute with distinction and with a dedication to conveying the work of the GCI cogently and thoughtfully. He will be sorely missed as both a colleague and a friend. Nevertheless, we wish him the very best as he enters this new moment in his life.

## Tribute



Photo: Susan Macdonald.

### JUKKA JOKILEHTO (1938–2023)

In November conservation lost an important friend, teacher, and mentor when Jukka Jokilehto passed away in Rome. Born in 1938 in Helsinki and educated as an architect and urban planner in Finland, Jukka became a global conservation practitioner and philosopher, especially through his long association with ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property). In 1973 he began teaching and coordinating ICCROM's iconic Architectural Conservation Course (ARC) and was responsible for developing its curriculum. Many participants cite their attendance as a life-changing experience. By the time he retired from ICCROM in 1998 he had also served the organization in many other strategic capacities, including as deputy director-general (1995–98) and as its representative on an advisory body to the World Heritage Convention. In 1986 he received a PhD from the University of York (UK) and worked closely with many ICCROM directors, including Sir Bernard Feilden, with whom he wrote *Management Guidelines for World Cultural Heritage Sites* (1993).

Jukka's insatiable curiosity about "all things heritage" was legendary. He created and taught numerous training courses, including in Rome and York, and held a professorship at the University of Nova Gorica (Slovenia). Among areas of importance for Jukka was the ongoing development of the Theory of Conservation, which was included in all the courses that he

helped organize. With generosity and humility, he shared his insights about heritage protection through his teaching and through his writing, including his now-classic reference *A History of Architectural Conservation*, published by Butterworth-Heinemann in 1999 and updated in 2017, published by Routledge. If you were lucky enough to be invited to the book-filled Roman apartment he shared with his adored wife, Azi—herself a sage conservation professional—you'd be treated to gracious hospitality, funny stories, and significant lessons that Jukka and Azi enjoyed discussing with colleagues from around the world.

Jukka was a longtime friend of the GCI, keenly interested in how the GCI was meeting the challenge of providing useful courses for professionals. He provided informal advice to several GCI senior staff, all of whom respected his wisdom, and he taught in the joint ICCROM/GCI Stone Course when it moved to Rome between 2011 and 2015. Jukka's interest in the GCI's Buildings and Sites department's work was much appreciated by many staff, several of whom were trained by him at ICCROM. In 2009 he served on a GCI panel advising the publication of *Historic Cities: Issues in Urban Conservation* (edited by Jeff Cody and Francesco Siravo, 2019), and he expertly assisted the editors with that volume. Jukka also encouraged editors Steven W. Semes, Siravo, and Cody in their critical selection of writings by Gustavo Giovannoni (1873–1947), a conservation architect about whom he knew a great deal: *New Building in Old Cities*, forthcoming in July from Getty Publications.

Jukka was a passionate advocate for the ongoing evolution and development of conservation practice to secure the world's cultural heritage. He was widely respected as a thoughtful, encouraging professional, whose knowledge and commitment to quality work were remarkable. Conservation has lost a towering figure, one who will be deeply missed by students and friends worldwide. We extend our heartfelt condolences to Jukka's family: his wife Azi (Dr. Mehr Azar Soheil), and their sons Darius and Dara.



# Print & Online Publications



Print publications are available for purchase at [shop.getty.edu](http://shop.getty.edu). Online publications are available free at [getty.edu/conservation](http://getty.edu/conservation).

## ONLINE

### **Bulla Regia Mosaic Conservation Project: A Model Field Project of the MOSAIKON Initiative**

Thomas Roby, Leslie Friedman, Livia Alberti, Ermanno Carbonara, and Ascanio D'Andrea, 2024

This new publication brings together the results of all the mosaic conservation fieldwork carried out at the archaeological site of Bulla Regia in northwest Tunisia between 2010 and 2017 by the collaboration of the GCI, the Institut National du Patrimoine (INP) of Tunisia, and the World Monuments Fund (WMF). This model field project was a component of the MOSAIKON initiative, a collaboration of the GCI, Getty Foundation, International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), and International Committee for the Conservation of Mosaics (ICCM), to advance the practice of mosaic conservation in the southern and eastern Mediterranean.

While aspects of the Bulla Regia project were previously published in short articles in the proceedings of the ICCM (2017 and 2020), this project report compiles the extensive documentation, mosaic conservation planning, and implementation work produced by the GCI project team and INP staff over several years. This body of work demonstrates the skills of the INP trainees and delineates a sustainable approach based on the use of local compatible conservation materials and basic recording and intervention techniques. Consequently, the planning and implementation work described here can be more readily adapted and used at other sites with large collections of mosaics throughout the Mediterranean region.

The *Bulla Regia Mosaic Conservation Project* is the culmination of almost two

decades of collaboration with the INP to build capacity to conserve Tunisia's mosaic heritage, especially on archaeological sites, through multiple training activities for both technician-level practitioners and site directors. Together with the previously published *Technician Training for the Maintenance of In Situ Mosaics* (available from [getty.edu/conservation](http://getty.edu/conservation)), this report delivers the most significant output of the long and fruitful INP-GCI collaboration.

# CONSERVATION PERSPECTIVES

## THE GCI NEWSLETTER

VOLUME 39 • NUMBER 1 • SPRING 2024

### The J. Paul Getty Trust

Katherine E. Fleming, *President and Chief Executive Officer*

### The Getty Conservation Institute

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Tom Learner, *Head of Science*  
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### Conservation Perspectives, The GCI Newsletter

Jeffrey Levin, *Editor*  
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Graphic Visions, *Lithography*

Tom Learner, Karen Trentelman, Vincent Laudato Beltran, and Joy Mazurek, *Guest Coeditors, Spring 2024*

*Conservation Perspectives, The GCI Newsletter* is distributed free of charge twice a year to professionals in conservation and related fields and to members of the public concerned about conservation. Back issues of the newsletter, as well as additional information regarding the activities of the GCI, can be found in the Conservation section of the Getty's website, [getty.edu/conservation](http://getty.edu/conservation).

The Getty Conservation Institute (GCI) works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research, education and training, field projects, and the dissemination of information. In all its endeavors, the GCI creates and delivers knowledge that contributes to the conservation of the world's cultural heritage.

The GCI is a program of the J. Paul Getty Trust, a cultural and philanthropic institution dedicated to the presentation, conservation, and interpretation of the world's artistic legacy.



We would like to acknowledge that the land Getty inhabits today was once known as Tovaangar, the home of the Gabrieleño/Tongva people. We show our respects to the Gabrieleño/Tongva people, as well as all First People, past, present, and future, and honor their labor as original caretakers of this land. Getty commits to building relationships with the Gabrieleño/Tongva community. We invite you to acknowledge the history of this land and join us in caring for it.

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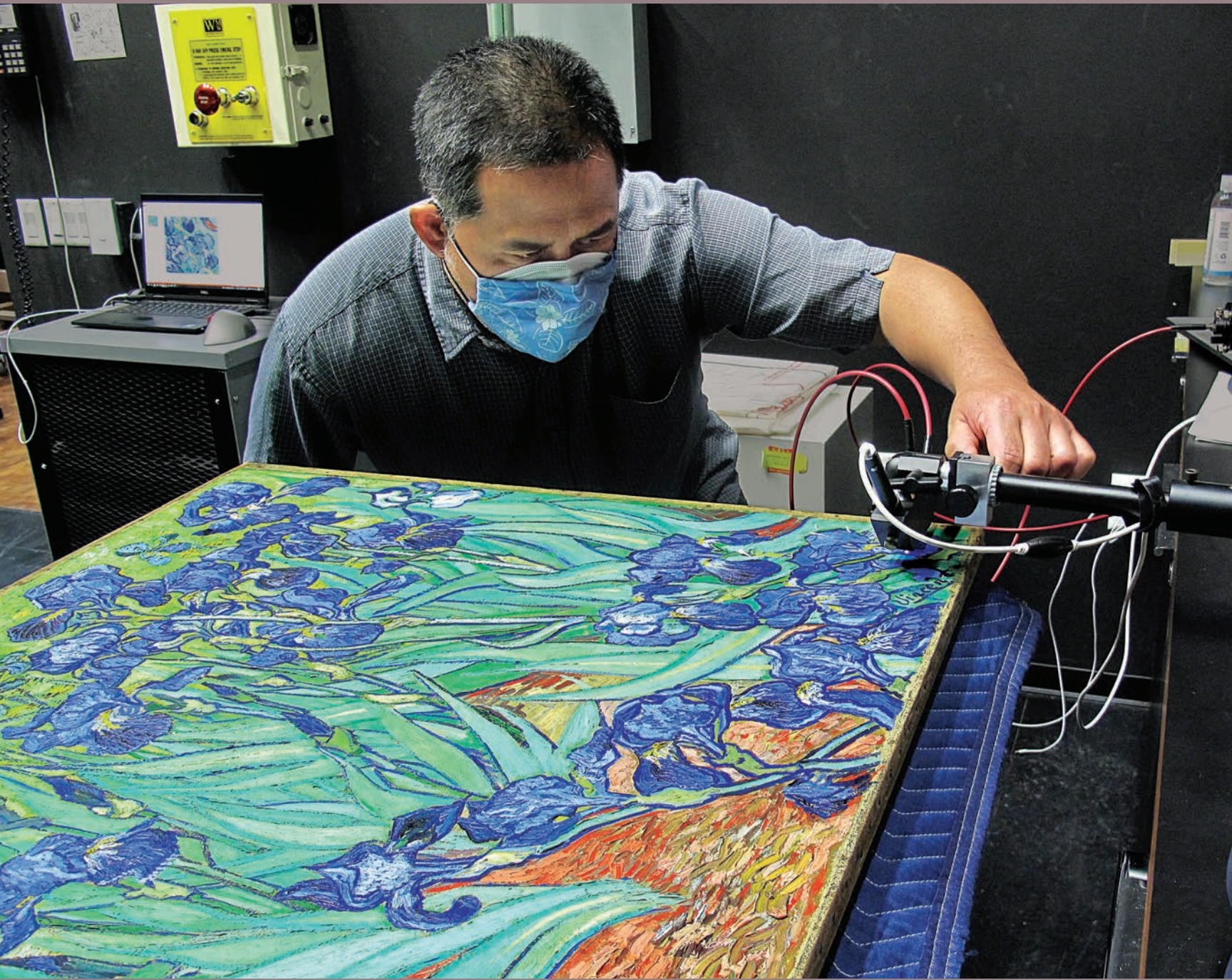
For more information about the work of the GCI, see [getty.edu/conservation](http://getty.edu/conservation) and





# CONSERVATION PERSPECTIVES

THE GCI NEWSLETTER



GCI scientist Vincent Laudato Beltran conducting microfading testing (MFT) on Van Gogh's *Irises*, which is in the collection of the J. Paul Getty Museum, object number 90.PA.20. The MFT analysis was part of an examination seeking to understand past color change in the painting. Photo: Catherine Patterson, GCI.



Conservation  
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Museum