Conservation

The Getty Conservation Institute Newsletter ■ Volume 17, Number 3 2002

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The Getty Conservation Institute (GCI) works internationally to advance conservation and to enhance and encourage the preservation and understanding of the visual arts in all of their dimensions—objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research; education and training; field projects; and the dissemination of the results of both its work and the work of others in the field. In all its endeavors, the Institute is committed to addressing unanswered questions and to promoting the highest possible standards of conservation practice.

The GCI is a program of the J. Paul Getty Trust, an international cultural and philanthropic organization devoted to the visual arts and the humanities that includes an art museum as well as programs for education, scholarship, and conservation.

Conservation, The Getty Conservation Institute Newsletter, is distributed free of charge three times per 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 Web site.
www.getty.edu

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Front cover: A selection of modern paint materials. The artists' paint market underwent a dramatic change in the 20th century with the development of synthetic paints. Created for the burgeoning house paint market, paints containing synthetic resins allowed for more rapid drying and displayed less yellowing with age than paints made with oil—the traditional binding medium. Synthetic paints were eventually formulated for the artists' market. By the 1960s one of these—acrylic emulsion paint—was becoming among the most widely used paint materials. *Photo:* © Tate, London 2002.

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By Michael Schilling, Susan Lake, Elizabeth Steele, and Suzanne Quillen Lomax

Feature

Throughout the 20th century, artists continually redefined our conception of what constitutes art, a process that included a proliferation in the employment of materials not previously known or used. As never before in history, artists have had at their disposal a tremendous assortment of natural and synthetic materials—and the license to use them. Modern artists have wholeheartedly embraced this profusion of products. New materials now incorporated into art include pigments with never-before-seen shades and hues, a variety of synthetic paint media, exquisitely transparent plastics, supple fabrics, exotic metal alloys, quick-setting adhesives, and electronic devices, to name merely a few.

Even the long-established field of painting has seen a change. Paintings created in earlier eras reflected a relatively limited supply of artists' materials. The only available paint media were waxes, plant gums, egg, milk, animal hides, vegetable oils, and plant resins. Pigments came from mineral deposits or were extracted from plants, insects, and animals. Today, however, artists are not limited to these traditional materials but may also choose from a variety of commercial paint media—such as acrylics, nitrocellulose, and alkyds—as well as a profusion of synthetic pigments.

Given that research into artists' materials and their use plays an important role in conservation, the tremendous increase in the number of available materials has created new challenges for conservation professionals.

Conservation Research

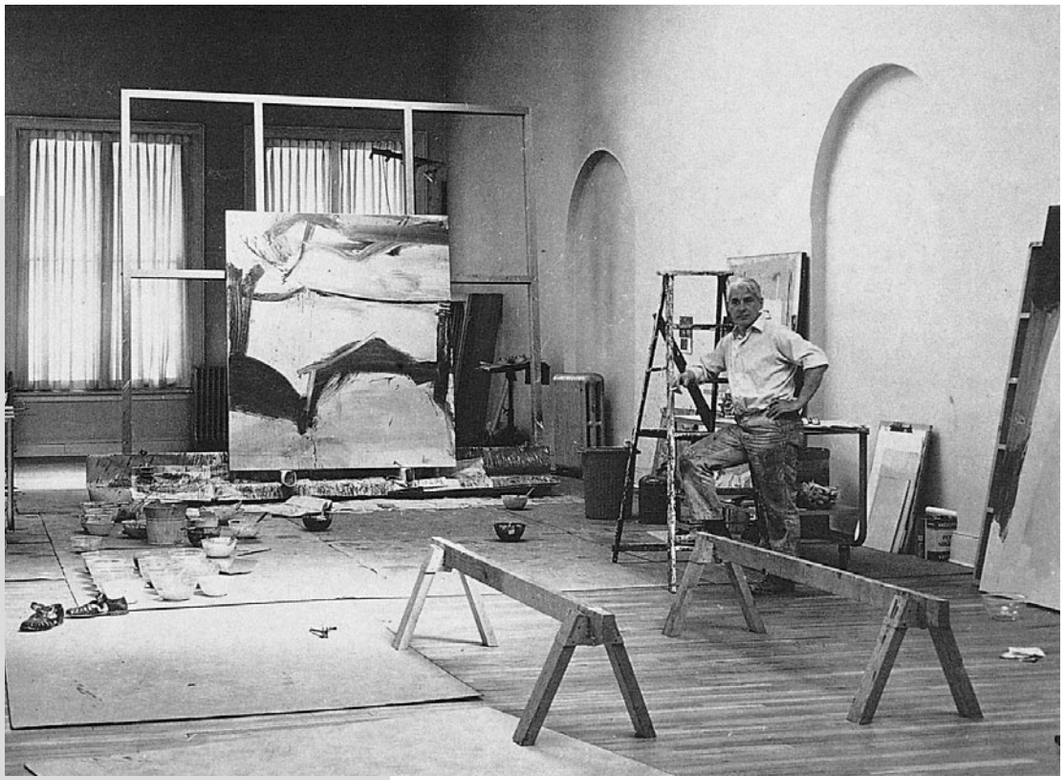
Examination and analysis of artists' paints yields information about artistic techniques and materials that helps guide decisions about care and conservation treatment. Conservators of modern art also take a keen interest in art as a process, carefully researching the ideas behind the specific techniques that the artist used to create the work. The challenge is finding conservation solutions that preserve a painting without disregarding the artist's intent.

How can we learn more about the complex formulations of contemporary artists' materials—formulations that are routinely changing? For example, an artist may have used the same brand of acrylic paint over a 10-year period, but the manufacturer may have modified the formulation several times during that period. Because product formulations are complex and may change rapidly, a single formulation may not be representative of an entire class of paint medium; this fact creates difficulties for conservators and conservation scientists. (Formulation changes can also make it difficult for an artist to develop a consistent set of refined working techniques.)

Conservators of modern and contemporary art have access to many sources of information not available to colleagues who preserve works of art from earlier times. Product labels or library holdings (for example, those of the Getty Research Institute) are such sources; sometimes records of product formulations can be obtained from manufacturers. Archival collections of artists' materials are also important sources of information. For example, Yale University, Tate, the Netherlands Institute for Cultural Heritage (ICN), and the National Gallery of Art, Washington, house invaluable collections of pigments, paints, varnishes, and media that scientists can study.

In addition, interviews with artists provide a unique source of information that may permit conservators to learn what products were employed in making a particular work of art, how the materials were used, the original intent of the artist, and the artist's attitude toward future conservation treatments. In 2000, 11 European museums, coordinated by the ICN and Tate Modern, established the International Network for the Conservation of Contemporary Art (INCCA). Although still in its infancy, the INCCA Web site (www.incca.org/) already contains a wealth of information. Another example is the Artists Documentation Program, in which artists are interviewed on film in front of their works. The program was initiated in 1991 with support from the Andrew W. Mellon Foundation and the Menil Foundation by Carol Mancusi-Ungaro, now director of conservation at the Whitney Museum of American Art in New York and director of the Center for the Technical Study of Modern Art at Harvard.

Right: Willem de Kooning in his studio with his painting *Untitled* in May 1962. Scientific analysis of selected de Kooning paintings from the 1960s and 1970s confirmed anecdotal reports that the artist had experimented with paint formulations. This information will assist conservators in improving care for his paintings from this period. *Photo:* Rudolph Burckhardt. Permission courtesy Tibor de Nagy Gallery, New York.



Below: Willem de Kooning, *Untitled,* 1962. Oil on canvas, 80 in. × 70 in. Photography by Lee Stalsworth. Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Gift of the Joseph H. Hirshhorn Foundation, 1966. © 2002 The Willem de Kooning Foundation/Artists Rights Society (ARS), New York.

Partnerships in Contemporary Art Preservation

For many years, artists and art materials manufacturers have conducted testing on art materials to determine their aging qualities. The American Society for Testing and Materials (ASTM) subcommittee on artists' materials has been working on lightfastness standards for over two decades, and the high quality of today's artist oil and watercolor paints is primarily due to its efforts. Currently, the committee is developing a lightfastness standard for colored pencils, as well as a standard for pastels.

The study of artists' materials has always been an activity of the conservation professional, as the search for new treatment materials pursues the replacement of older, less-effective ones. On rare occasions, spin-offs result that improve an artist's options. One example is Gamvar varnish—a nonyellowing substitute for natural resin varnishes—developed by René de la Rie at the National Gallery of Art and marketed by Gamblin Artists Colors.

Recently organizations have provided funding to promote the preservation of contemporary art, including fellowships at Tate and at the National Gallery of Art (see "Modern Paints," p. 18). In addition, the Andrew W. Mellon Foundation has sponsored a number of important meetings in which conservators, curators, and conservation scientists have discussed research needs and approaches.

Finally, manufacturers of artists' materials—such as Golden Artist Colors, Gamblin Artists Colors, Sennelier, Sinopia, and Winsor & Newton—are now providing information on their products via the Internet.

Still, even with these resources, much work remains to be done in identifying the vast number of materials used by contemporary and modern artists and in developing a better understanding of the properties of these materials. Conservation science can play a significant role in this effort. There are now a number of scientific analytical techniques to aid in identifying artists' materials and techniques—and although most were refined and developed to study works of art made with more traditional materials, they can also be applied to 20th-century artworks and their materials. From minute samples of paint, pigments are identified with polarized-light microscopy (PLM), X-ray fluorescence (XRF), and X-ray diffraction (XRD). Organic binding media may be identified with gas chromatography (GC), liquid chromatography (LC), and mass spectrometry (MS). Another tool, Fourier-transform infrared microspectrometry (FTIR), is useful for identifying pigments and media.

Identification of the materials—and their properties—in contemporary objects is being pursued at several major institutions. At Tate, for instance, Thomas Learner developed a technique for identifying modern paint media using pyrolysis gas chromatography–mass spectrometry. Scientists at the Canadian Conservation Institute constructed a transportable FTIR spectrometer that has been used to differentiate traditional materials such as Japanese lacquer from imitations made from cashew oil or alkyds. And at the Carnegie Mellon Research Institute, Paul Whitmore developed a device for assessing, in a microscopic-sized spot, the lightfastness of contemporary colorants early in an object's life.

Many modern and contemporary paintings have not yet undergone major conservation treatments, a process that can sometimes remove components from the original paint media. As a result, natural aging processes are the predominant factors in the alteration of the composition of materials in modern and contemporary paintings. They are, therefore, ideal candidates for scientific study of the material aging processes.

The application of scientific analytical techniques to more recent works of art has increased our understanding of artists' materials and working methods, thereby enhancing our ability to preserve these paintings. These techniques were recently applied in research on paintings by two 20th-century U.S. artists—Willem de Kooning and Jacob Lawrence—which was conducted in the laboratories of the GCI and the National Gallery of Art. This research illustrates how modern science can reveal new insights about contemporary works of art, which ultimately can aid in the conservation of these works.

Willem de Kooning, *Woman, Sag Harbor,* 1964. Oil and charcoal on wood, 80 in. × 36 in. Photography by Lee Stalsworth. Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Gift of Joseph H. Hirshhorn, 1966. © 2002 The Willem de Kooning Foundation/Artists Rights Society (ARS), New York.

Willem de Kooning, *Woman,* 1965. Oil on wood, 80 in × 36 in. Photography by Lee Stalsworth. Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Gift of Joseph H. Hirshhorn, 1966. © 2002 The Willem de Kooning Foundation/Artists Rights Society (ARS), New York.

Willem de Kooning

Throughout his long career, Willem de Kooning routinely exploited unconventional materials for his paintings. A wealth of historical and anecdotal records report that the artist regularly mixed house paint, safflower cooking oil, water, egg, and even mayonnaise with his artists' paints to achieve desired visual and textural effects. Despite the extent to which his methods and materials have been described by his contemporaries, there has been considerable confusion as to de Kooning's actual practices at specific times in his career. Additionally, there is concern that the idiosyncratic paint formulations that he reportedly used will have a negative effect on the long-term stability of his paintings. The paintings executed during the 1960s and 1970s, in particular, are problematic for conservators, with passages that remain soft and sticky. Such paint surfaces are easily deformed when touched, and they readily pick up surface dust.

To address these issues, a study was undertaken to analyze the binding media and pigments of a selection of de Kooning's paintings from the period of 1960–1977. Due to similarities in composition between traditional oil paint media and the media de Kooning reportedly used, it was possible to use GC-MS procedures developed for traditional paints to test samples from his paintings.

The results of the study provided valuable insights into de Kooning's choice of medium. First, no evidence was found in any of the samples analyzed to support the claims that de Kooning painted in egg tempera medium or with mayonnaise. Early in his career, de Kooning did use house paints extensively, often in combination with artists' oils. In paintings from the early 1960s, he abandoned his use of house paints and turned to artists' tube paints made from linseed, castor, and poppy oils. The earliest evidence of his use of safflower oil comes in paintings from 1964 or 1965, and it appears that safflower oil, mixed with water, artists' tube paints, and a solvent, became his medium of choice until the middle 1970s.

These analytical findings support anecdotal reports that de Kooning, increasingly frustrated with the fast-drying properties of the newer house paints, searched in the 1960s for a paint formulation that would meet his requirements for a medium that could be reworked over extended periods of time. This more fluid paint facilitated the complex and varied brushwork that is the hallmark of his paintings from this period. In two untitled paintings from 1977, de Kooning appears to have abandoned his safflower-and-water paint mixture entirely, turning to artists' tube colors exclusively after he learned of the dangers posed by nondrying oils.

From a careful review of the findings, it is clear that de Kooning's addition of water to his paintings—evidenced by air bubbles found in the paint—has had little effect on the extent of breakdown of the oil media. Linseed oil paints were degraded to a greater degree than were paints made with slower-drying media, which runs counter to normal experience. Another important finding of this research is a greater appreciation for the influence of pigments on the stability and long-term tackiness of oil paints. The paints that remain soft generally are the full-strength cadmium colors or those containing synthetic organic dyes. By contrast, paints with significant amounts of white pigment have formed hard films.

These analytical results provide valuable information that will assist conservators in improving care for de Kooning's paintings from the 1960s and 1970s. Ultimately, the wisest course is preventive. It is recommended that these paintings be framed under glass, if possible; when this course is not practical, it is recommended that they be displayed and stored in as dust-free an environment as possible. When these paintings travel, they must be housed in frames to ensure that nothing will come in contact with their surfaces. Ultimately, if a painting must be cleaned, the analytical findings make it possible for informed choices to be made on how aggressively selected passages of the painting may be treated. Because the pigment—not the binding medium—was found to have the greatest influence on the stickiness of the paint, it is possible to use the pigment as a parameter for predicting vulnerability.

Willem de Kooning, *. . . Whose Name Was Writ in Water,* 1975. Oil on canvas, 76¾ in. × 87¾ in. Photography by David Heald, © The Solomon R. Guggenheim Foundation, New York. © 2002 The Willem de Kooning Foundation/Artists Rights Society (ARS), New York.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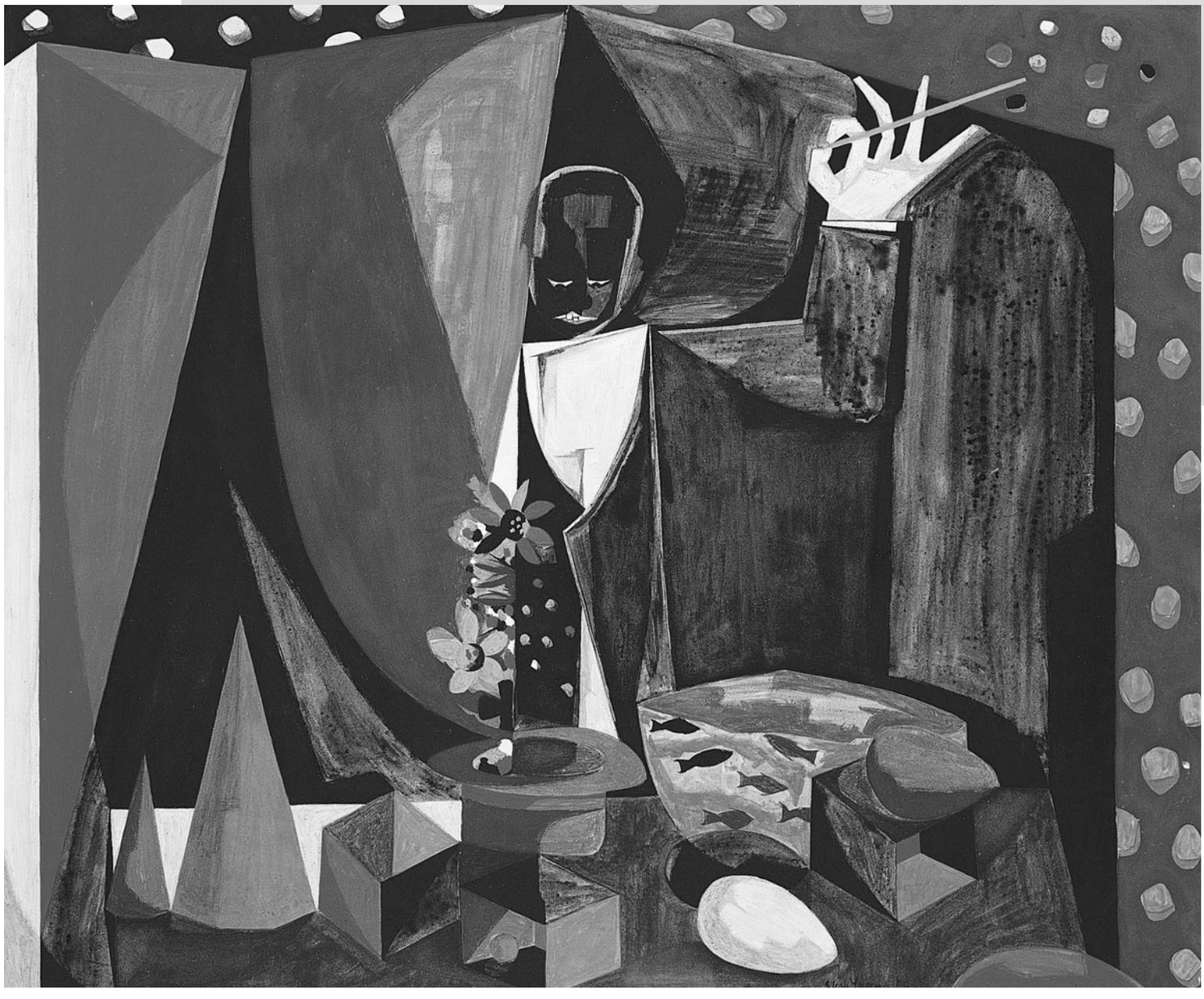


Jacob Lawrence

Jacob Lawrence's early training in the 1930s at the Utopia House and at the Works Progress Administration Arts Workshop in Harlem, New York, introduced him to the materials that he would use throughout his career—tempera paints, various papers, illustration board, and hardboard. The use of matte, opaque, water-based paints would predominate in his work. Unfortunately, the precise kinds of aqueous media that Lawrence used have often been misidentified. Tempera, casein, gouache, and watercolor can be easily mistaken for one another, particularly when thinned to a wash consistency, and many of Lawrence's works have incorrect media attributions as a consequence.

To better identify the aqueous media used by Lawrence, a selected group of his paintings from 1938 to 1975 was studied. In testing the paint samples, pigments were identified using PLM, and FTIR was used in conjunction with GC-MS procedures developed for traditional paint media. The knowledge produced by this research of the medium in each Lawrence painting—knowledge grounded in fact, not speculation—doesn't just provide accurate information for scholars and historians and for museum records. It also sheds light on common deterioration problems associated with some of Lawrence's paintings, such as flaking paint or efflorescence formation, and it can guide their conservation.

The word *tempera* comes from the Latin *temperare,* meaning to "mix" or to "regulate." The classic recipe, as recorded by Cennino Cennini in *Il libro dell'arte* in the late 14th century, calls for emulsifying egg yolk with water, and is considered by purists to be true tempera. However, in the first half of the 20th century, many new water-based paints were developed to meet a demand from the growing advertising industry for fast-drying, opaque, matte paints. Recipes changed in response to availability and cost of raw materials—yet paint manufacturers classified most as tempera. While a shared characteristic of these paints was the ability to be thinned with water, the binding media may have included such combinations as gum and glue; starch and glue; glue and egg; egg and oil; egg, resin, and oil; and casein and glue.

Blind Beggars (1938) is among Lawrence's first recognized works executed with a commercially produced tempera. Analysis revealed that the red paint is composed of iron oxide red and transparent mineral filler, and the binding medium was identified as a mixture of gum and glue. Although *Blind Beggars* is in good condition, the presence of glue in the binder may be among the causes of instability in the paint layers in many of Lawrence's early tempera works. Awareness of this characteristic in some of his paintings should alert museums and collectors to the need for careful regulation of the relative humidity in which these paintings are exhibited. Knowledge of the components of the paint film will enable conservators to make better choices of adhesives, materials, and techniques for the treatment of these paintings.

Opposite page, top left: Jacob Lawrence, *Blind Beggars,* 1938. Tempera on illustration board, 20 in. × 15 in. The Metropolitan Museum of Art, Gift of the New York City W.P.A., 1943. (43.47.28). Photograph, The Metropolitan Museum of Art. © Gwendolyn Knight Lawrence, courtesy of the Jacob and Gwendolyn Lawrence Foundation.

Opposite page, top middle: Jacob Lawrence, *The Checker Players,* 1947. Tempera on gessoed panel, 50.8 cm × 60.9 cm. Worcester Art Museum, Worcester, Massachusetts, Gift of Saundra B. Lane in memory of her husband, William H. Lane, and purchased through the Stoddard Acquisition Fund. © Gwendolyn Knight Lawrence, courtesy of the Jacob and Gwendolyn Lawrence Foundation.

Opposite page, top right: Jacob Lawrence, *Vaudeville,* 1951. Egg tempera on fiberboard with pencil, 29⅞ in. × 19 15⁄16 in. Photography by Lee Stalsworth. Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Gift of Joseph H. Hirshhorn, 1966. © Gwendolyn Knight Lawrence, courtesy of the Jacob and Gwendolyn Lawrence Foundation.

Opposite page, bottom: Jacob Lawrence, *Magic Man,* 1958. Tempera and pencil on fiberboard, 20 in. × 24 in. Photography by Lee Stalsworth. Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Gift of Mr. and Mrs. Henry Folkerson, 1981. © Gwendolyn Knight Lawrence, courtesy of the Jacob and Gwendolyn Lawrence Foundation.

Jacob Lawrence working on the maquette for *Games* in his Seattle studio in March 1979. The use of matte, opaque, water-based paints dominated Lawrence's work. Unfortunately, because aqueous media can easily be mistaken for one another, the paints in his works were often misidentified. Scientific investigation of a selection of Lawrence's paintings has provided more precise information on the media of these works. This knowledge will be used to address common deterioration problems associated with some of his paintings. *Photo:* © Mary Randlett.

In the late 1940s, Lawrence made his own egg tempera using a recipe—which he recalls obtaining from a friend—that called for equal parts egg yolk and water, plus a few drops of formaldehyde as a preservative. Analysis of the binding medium on Lawrence's *Checker Players* (1947) confirms it to be composed of pure egg. In contrast, analysis of the medium in *Vaudeville* (1951), another egg tempera painting, indicates that it is a commercially prepared medium incorporating oils and plasticizers into the paint. One problem with some egg temperas is the formation of efflorescence on the artwork's surface, an aging phenomenon. Generally associated with dark hues, a white crystalline substance was noted on the surface of many works examined for this study. A sample of this white crystalline exudate taken from *Magic Man* (1958) was identified as a free fatty acid deposit.

The best means for removing efflorescence from the surface of a painting is currently under consideration by conservators; approaches range from removing it with a soft brush or a small vacuum to using a cotton swab dipped in solvent. Could the commercial preparation of the egg tempera be the cause of the efflorescence? Works by Lawrence executed with a medium consisting solely of egg yolk do not seem to exhibit the white exudate. The analysis conducted on Lawrence's paints adds to the growing body of scientific knowledge of the causes and treatment of efflorescence in paint films.

In a later work on paper, *Street to Mbari* (1964), more than one medium may be present. Like so many Lawrence pictures dating from the 1960s onward, the medium had been assigned as gouache. However, analysis of one color sample identified glue as the principal binder, which indicates a tempera medium. From the 1950s through the 1970s, it appears that Lawrence bought different types of water-based paints. It seems probable that at many points in Lawrence's career, he simply had an aqueous media palette, and that he didn't distinguish among media but, rather, bought paints for their colors. Given the abundance of newly available, commercially prepared aqueous media in the 20th century, it should be no surprise to find many different types of paint in a single work of art.

This increased understanding of the extent of Lawrence's use of commercial paints is important for the ultimate conservation of his work. Commercial paint tubes often contain additives to preserve the contents, whereas paints mixed by artists from simple recipes generally do not; ultimately, these compositional variations could lead to different pathways of deterioration for commercial versus homemade paints, and hence they require different approaches to conservation and preservation.

A Multidisciplinary Challenge

Modern and contemporary paintings present a variety of new challenges to conservators. Today's artists can choose from an incalculable variety of commercially available products. Yet neither the long-term aging behavior of these materials nor safe methods for conserving the vast majority of them are known.

Given the magnitude of the task, multidisciplinary collaborations on national and international levels are essential for preserving modern and contemporary paintings. Fruitful partnerships have been established between manufacturers of artists' materials, conservation science laboratories, and organizations that set standards, such as the American Society for Testing and Materials (ASTM). Research priorities have been discussed at meetings of conservation professionals, and based on the enthusiasm expressed by the participants in these meetings, on the commitment of institutional resources, and on the extent of the partnerships, it can be said that the future of modern and contemporary paintings conservation looks bright. But it is clear that curators, conservators, and conservation scientists will need to work closely together in order to preserve the diverse, evolving legacy of today's artists.

Michael Schilling is a senior scientist and head of the analytical research section at the GCI. Susan Lake is the head of conservation at the Hirshhorn Museum and Sculpture Garden. Elizabeth Steele is the conservator at the Phillips Collection. Suzanne Quillen Lomax is an organic chemist at the National Gallery of Art, Washington, D.C.

Time and Change

A Discussion about the Conservation of Modern and Contemporary Art

Those charged with conserving modern and contemporary art face a variety of practical and philosophical challenges. We asked three individuals whose professional work has required confronting these challenges to offer their thoughts on what constitutes the major issues in this area of conservation.

Jim Coddington is the Agnes Gund Chief Conservator at the Museum of Modern Art (MoMA) in New York, where he has been a conservator since 1987. During that time he has lectured and published on a number of topics, including the theory and practice of modern art conservation, digital imaging, and image processing in the conservation and structural restoration of paintings.

Carol Mancusi-Ungaro holds a joint appointment as director of conservation at the Whitney Museum of American Art and founding director of the Center for the Technical Study of Modern Art at Harvard University Art Museums. She has written on Mark Rothko, Jackson Pollock, and Barnett Newman, and she continues to engage in research documenting the materials and techniques of living artists, as well as other issues related to the conservation of modern art.

Kirk Varnedoe is professor of art history in the School of Historical Studies at the Institute for Advanced Study in Princeton, New Jersey. From 1988 to 2001, he was chief curator of painting and sculpture at MoMA. Prior to that, he taught at New York University's Institute of Fine Arts and at Columbia University. Recipient in 1984 of a MacArthur Foundation Fellowship, he has authored numerous books and catalogues on 19th- and 20th-century art.

They spoke with Jeffrey Levin, editor of **Conservation, The GCI Newsletter.**

Jeffrey Levin: *Is there a distinction that one can make in terms of the conservation of modern or contemporary art, as opposed to the conservation issues of older works of art—or is it pretty much the same set of issues?*

Kirk Varnedoe: Isn't this a trick question? If you had the same set of problems with ephemeral materials, they would have resolved themselves centuries ago. The artists who built Stonehenge may have done performance pieces or worked in beeswax or other things that contemporary artists are doing—it's just that time has destroyed it all, so we don't know. The preservation of older works of art, de facto, has got to be different from dealing with contemporary works of art, simply because they've survived. It doesn't necessarily mean that the conservation questions posed, had we encountered them in 1500, would be radically different from those we encounter today.

Jim Coddington: All art, at some time, is contemporary art. It often pushes the boundaries of known material preservation. There is a natural filtering process that the second law of thermodynamics takes care of for us. Everything tends to chaos.

Carol Mancusi-Ungaro: I think, though, that conservation does step in here, in that some materials—like paint on canvas, for example, as opposed to paint on panel or on stone—presented issues of preservation that perhaps hadn't been addressed before. When painting on fabric became a widespread technique, then conservation rose to the occasion and figured out a way to preserve the innovation.

Jim Coddington: There's a second question here, and that is—Is there something fundamentally different about the way a conservator of modern art thinks about the work of art than a conservator working on an older piece thinks? I would say in general, no, in that we have general sets of standards and working guidelines.

Carol Mancusi-Ungaro: I agree, but I also think that when we restore a representational work of art, we can go about it in a more localized way, allowing the eye to join areas that might be missing or might be

corrected. It's quite different if we're working with a monochromatic piece, where a more overall approach is required. From my perspective, treatments on monochromatic works that have failed have been ones that have been approached as if the painting were a representational work that could withstand a localized treatment.

Jim Coddington: But you can have large monochromatic passages in representational works that present the same optical problem.

Carol Mancusi-Ungaro: That's true, and we've seen those successfully and unsuccessfully done. But there's something about having a broad, expansive color that I think requires a different kind of approach.

Jeffrey Levin: *Have artists in modern times lacked some of the knowledge of materials science that artists in earlier ages had? Your answers to the first question suggest that, with regard to knowledge of materials, there's always been a learning curve.*

Kirk Varnedoe: My feeling is that in Renaissance Florence, you were intimately involved with the people making your paint if you weren't making it yourself. You'd have a pretty intimate knowledge of the nature of what you were working with, just because you weren't far from the site of production and because the level of specialization wasn't as extreme as it is now. In most cases, artists now are radically detached from the makers of the material that they work with. That's a big difference. Even in the 19th century, any sculptor who farmed out his work to a bronze foundry still understood quite well the process of bronze casting. I'm not sure that an artist today who sends his work out to be done in stainless steel or in titanium by some technician is going to be as closely involved.

Carol Mancusi-Ungaro: I think that's right. But I also think that although an artist may not be as informed about the constitution of the material, or the making of the material, that lack of information doesn't necessarily affect his or her relationship with the material and his or her use of it. The intimacy is still there.

Kirk Varnedoe: Yes. If you take an artist like Eva Hesse, for example, she found properties in materials that the people who made them didn't suspect were there. She had an intimate knowledge of what those materials would do that their makers might have regarded as inadvertent consequences of the properties of the material but which, for her, had a poetic value.

Jim Coddington: I think that there is a limit to how far we can go with this. If you take it to the extreme, it is that the contemporary artist is essentially ignorant of his or her materials—which is surely not the case. I am pleased that Richard Serra knows enough about his materials to keep those steel sculptures standing. It may be more of

Courtesy Jim Coddington

> **"All art, at some time, is contemporary art."**
>
> **—Jim Coddington**

an engineering problem, but that is essentially what the artist asks of the material that he's chosen.

Kirk Varnedoe: But, Jim, that's a perfect case, because Richard has to go to people who are normally fabricating ship hulls or nuclear reactors. They think this material does one thing, and Richard says, "I think this material can do something else—it can bend in ways that no practical purpose requires, but my artistic purpose requires." He has one understanding of the potential of the material, they have another understanding of the limitations of the material, and it's a give-and-take between the two.

Jim Coddington: I would say that Serra brings to the materials enough knowledge of their properties so that his choices are informed choices and not random ones.

Carol Mancusi-Ungaro: I can't help but think of Jackson Pollock in this instance. Here's a person who used industrial paints for their quick-drying properties and flexibility. The material provided him with what he needed in order to paint the way he did; it enabled the process. He said, "The method of the painting is the natural outgrowth of the need." The intimacy of the artist with the material was definitely there.

Kirk Varnedoe: Well, Pollock initiated an entire school of contemporary art where the properties of the material became the determining factor in the look of the work. The fact that industrial paint fell the way it did, that it had that kind of gravitational property, that kind of viscosity, was everything to Pollock's compositions. And

similarly, the pliability of certain kinds of resins gave Eva Hesse's work a feeling for a kind of bodily inflection on minimalist properties. The gooeyness, the resistance, the very nature of materials became the speaking voice. In the 1950s, with de Kooning and others, your signature was the gesture with which you pushed the materials around. But in the 1960s and 1970s, your signature became the material that you chose, because the expressive properties were exploited directly from the inherent properties of the material itself.

Jeffrey Levin: *But when we talk about properties, don't we have to distinguish between the properties of the materials with respect to the effect that the artist wants to achieve, and the properties of the materials in terms of their long-term stability? Or is that something we don't need to be concerned about? If artists can achieve what they want to achieve, at least initially, with particular materials, then long-term stability be damned.*

Kirk Varnedoe: Hesse is a perfect example because of the extreme fragility of some of her pieces now. Some of the resinous materials that she used lost their flexibility when they decomposed and began to get brittle. Then the works lost everything that Hesse loved about them. That's a real problem.

Jim Coddington: When this question was posed to her—that these materials might not last all that well—she said she was conflicted. She wasn't certain as to what her ultimate opinion was about the longevity of her work. And yet she finally opted to stick with these materials. Had she lived longer, her position might have evolved over time.

Carol Mancusi-Ungaro: We have to recognize, though, that all materials change over time, including traditional artists' materials. Certainly the case of Hesse is extreme in that the properties that she was going for are, in fact, gone. But that phenomenon is seen in different degrees with different artists, and we've always had that to contend with in conservation.

Jeffrey Levin: *Which leads us to the issue of the needs of conservation being inserted into the artist's creativity. Is that something we even want to talk about? Or do we just have artists do their work, and then, whatever the consequences are, conservators have to deal with them?*

Carol Mancusi-Ungaro: The artist should use the material that the artist needs to use, and the conservator needs to understand the how and why and try to preserve that intent.

Jim Coddington: Yes, my simple answer is that we should not get involved.

Kirk Varnedoe: I'd like to dissent. If I could've told Duane Hanson, when he started working with fiberglass, that he was going to get cancer if he didn't take certain precautions, it wouldn't have been to stop him from working with the material. It would be asking him to make certain choices and take certain precautions. If you saw an artist using the improper amount of fixative in his photographic mix, wouldn't you say, "Listen, these prints are going to fade in five weeks because your chemicals are wrong." And if you could've said to Hesse, "If you just add a certain rubber base into this fiberglass, it won't change the property you're using, but it will ensure its flexibility for 20 years longer," wouldn't you? I wouldn't hesitate to make that knowledge available to them.

Jim Coddington: I've fielded many a phone call from an artist saying, "I've made this painting, now I want to varnish it." And I ask, "Why?" And they say, "Because that will make it last longer." And I say, "Wait a minute. It might not." That's just a different version of the dialogue you're talking about, Kirk—talking to them about what they want to achieve, and is there another way to get there that makes it last longer, if lasting long is something they're looking for.

Carol Mancusi-Ungaro: That's absolutely true. My favorite days at the Whitney, I have to admit, are going to artists' studios when they call and say, "I have a problem. Can you come take a look at this?" What I object to is putting forth a definitive list of materials that we think should be used.

Jeffrey Levin: *What is the appropriate way of educating or informing artists as they do their work?*

Kirk Varnedoe: My old mentor, Al Elsen, was in the forefront of getting the College Art Association (CAA) to take a strong stance on the toxic properties of materials. The companies weren't advertising the stuff, and the CAA became kind of like the FDA, going after these materials. Now there's nothing so extreme here, but it seems to me that the annual CAA meetings where artists get together, newsletters, and artist magazines are perfect venues for conservators to disseminate this kind of information that artists need to make informed choices.

Jim Coddington: In the case of CAA, this has been done. The American Institute for Conservation has done a couple of CAA sessions where artists can come. We've got conservators and scientists there—and about a dozen people typically show up. Also, there is a subgroup of the American Society for Testing and Materials that sets standards for paints and canvases, and they meet annually at CAA. Again, those are sparsely attended meetings. It's maybe callous to put it this way, but how do you get somebody interested enough to say, "My career is advanced by attending this meeting and knowing about these materials." I don't have the answer to that. Somehow or other, there

needs to be a consciousness-raising that attending these meetings is important to your career.

Carol Mancusi-Ungaro: There's certainly a lot of research that's done within our field that pertains to this question, and I'm curious about how that can best be disseminated. Maybe it should be translated into a form that is understandable—such as a column, perhaps, in a journal like *ARTnews* or *Artforum.* This information in a monthly column could be very helpful to artists. Also, conservation is becoming more and more a part of the curriculum for art history students and artists. Perhaps it should be within the purview of conservators to put this information forth, rather than trying to go through art departments.

Jim Coddington: It's analogous to our efforts doing art historical research shoulder to shoulder with art historians. This ought to be done shoulder to shoulder with studio art teachers, not one in front of the other. By shifting our focus over the next couple decades, perhaps we can make progress on teaching studio art professors and students about the importance of this.

Kirk Varnedoe: If art schools that train young artists were responsible in this regard, there'd be a standard course of cautionary tales to raise people's consciousness—if you're interested in preserving your work, look at what happened to these guys.

Jim Coddington: Some of the paint manufacturers—people like Mark Golden and Bob Gamblin—work with the conservation field to do the best possible job in terms of longevity of the materials. Mark Golden's got chemists on his staff, and he works closely with artists trying to answer the particular questions they have in looking for certain working properties, keeping the longevity of those materials in mind.

Jeffrey Levin: *If an artist intentionally makes the choice to use ephemeral materials—understanding that it's not going to last—is it appropriate to make any attempt to preserve it over a longer period of time?*

Jim Coddington: I would first want to be absolutely sure what we mean by "intentional" and "ephemeral."

Kirk Varnedoe: Well, let me take one example, Jim. Picasso and Braque chose to use newsprint, right? We're very concerned to preserve those works of art that have the newsprint in them, even acknowledging that the newsprint doesn't look the way it looked when they originally made it. We still want those things with the newsprint in them, and we'll do a lot to make sure that they stay around. You'd have to say that newsprint is an ephemeral material. On the scale of things, it's not the same as using spit, for example, which is not going to last nearly as long. But there're a thousand shades of gray in this question.

Jim Coddington: Yes, and that's why you would want to be sure that the artist was aware of whatever degree of ephemerality it had and that it was chosen intentionally. Let me choose another example that points out how many shades of gray there are. It's been reported that van Gogh said that if some of his colors faded or changed over time, you could just scrape away some of the impasto and you'd have the original color back. That was his solution to the ephemeral in his art. But I'm sure no one is prepared to take him up on this.

Carol Mancusi-Ungaro: It's important to understand from the artist what's most crucial to preserve. If the color of the newsprint clearly wasn't the most important thing in these works, then it makes sense that we accept that change. Most artists accept change. But—getting back to Hesse again—if it affects the actual facture that was the work, then it's a different question. It's very important to try to understand from the artists, while they're alive, what their feeling is about this. Sonja Alhäuser had a piece at Harvard made out of chocolate and popcorn that was only intended to last three months. That was her intent. She made it very clear that the work ends when the material—in this case, the chocolate—loses its nature. She said she left nothing for the conservator to do.

Jim Coddington: One of the things that was first noted and valued about those Picassos and Braques was that these guys were using these ephemeral elements and it was sort of shocking. We no longer find this shocking at all. And yet, as Kirk has pointed out, we value them for the way they look now. We've assigned a historical value to them, or an aesthetic value to them, and that's why we don't intervene to remove them or fix them.

Kirk Varnedoe: And part of the aesthetic value that we assign to those things has something to do with the fact that they have aged. There's something special for me about the history of art in the primary object. Take, for example, the Joe Kosuth chair that we have at MOMA—the chair and the photostat on the wall. I get something out of seeing that chair and that dim photostat that was made 25 years ago that I don't get out of seeing remade things. There's something authentic or compelling about the passage of history across these things.

Jeffrey Levin: *You're talking about the history* **in** *the art, as well as the history* **of** *the art.*

Jim Coddington: This is why this whole bundle of questions is a moving target. There are so many different meanings within a work of art—even the materiality of a work of art—and we emphasize different ones at different times. One of the interesting things about

the symposium that took place at the Hesse exhibition was that some of the scholars argued that the changes that had occurred in these works of art—and some works had discolored dramatically—essentially have become the art itself. The way they look now and have looked over the last decade or so has influenced a generation of scholars and artists and therefore become the work of art—and to even restore it would be, somehow, inappropriate. And this thinking leads you—

Kirk Varnedoe: Down that path where you get the grimy Sistine Chapel ceiling, doesn't it?

Carol Mancusi-Ungaro: Yes.

Jim Coddington: You get a paralysis that I don't think does the artist a service. And so what we're doing is continually slicing all of these issues finer with each particular example.

Carol Mancusi-Ungaro: I think about artists like Degas, who was very clear that time was a player in his work. Time would change the work, and that was understood. He might not have liked it, but that was part of it. But that's not what Sonja Alhäuser is saying. What *I'm* saying is that artists differ, and we need to understand that. And while we may be comfortable with seeing the fat and lard in Joseph Beuys's works look older and darker, that may not have been his intent at all.

Kirk Varnedoe: But it's never anybody's intent to die either. The fact is that change and mortality get a hold of everything and everybody. One of the most moving things that we observe in life is the struggle against that—and yet the fact of it. That someone should intend to escape from it is an important part of human nature. But the inability to do it is also an important part of being human.

You know, Rauschenberg painted a set of white paintings—and he repainted them again. Should we just keep repainting them? Suppose I'm in a museum and I think they're getting a little tatty so I just throw them in the barn. I know they're the ones that his assistant did while he was alive, but that doesn't make any difference, he's dead, the assistant's dead. I'm just going to get my assistant to whip up a new set of white canvases and put them on the wall.

I'm not happy with this.

Jim Coddington: To play devil's advocate here, why not? What is it about those re-creations that you don't like—that Rauschenberg didn't see them to say that they are good? Or is there something in the touch that you would find inauthentic, even though the touch may be three times removed now?

Kirk Varnedoe: Somehow when I see them age, I know that that gesture—that act of will—was made at a certain moment in history by a certain human being.

Courtesy Carol Mancusi-Ungaro

"I think about artists like Degas, who was very clear that time was a player in his work. Time would change the work, and that was understood."

—Carol Mancusi-Ungaro

Carol Mancusi-Ungaro: But it may not reflect what was done at that time.

Kirk Varnedoe: In what sense?

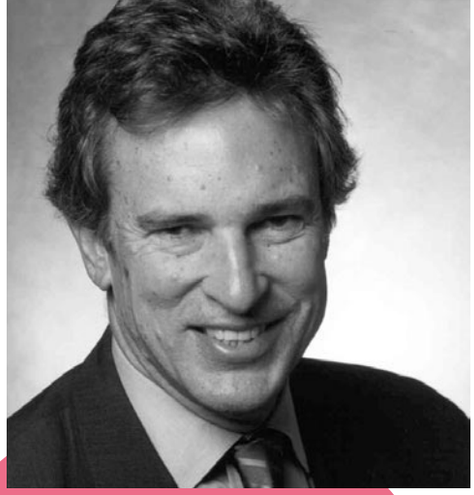
Carol Mancusi-Ungaro: Now it's not white. It's beige and has yellow spots here and there.

Kirk Varnedoe: The question is—to what degree do you want to restore it? It is not a black-and-white question.

Carol Mancusi-Ungaro: Right. It is never a black-and-white decision. If Rauschenberg's white panels have turned a little beige or tan, that's okay. But if there's a big spot on them, we have to deal with that. We're constantly making judgments about keeping a certain amount of aging, but we can't allow it to get to a point where it's no longer related to what it might have been originally.

Jim Coddington: There is a very practical question here. Let's say Kirk is really dissatisfied with these particular Rauschenbergs. Is someone going to say, okay, these works will never again see the light of day—either restored or as re-creations? In some retrospective, somebody's going to bring them out—and, who knows, they could be foxed all over the place and look bad. And somebody will construct a rationale as to why that is a valued look.

Kirk Varnedoe: Suppose you had an eccentric sculptor who had produced a work that had inherent vice, and over the years, the work collapsed. The sculptor no longer wanted it shown in the collapsed form, but wanted to remake it into a form that he found acceptable.



Courtesy Kirk Varnedoe

> **"We're much more conscious of our fallibility."**
>
> **—Kirk Varnedoe**

Now here's your dilemma. You can't restore it to the way it used to look, and the artist desires to remake the work himself. It's his work, and he's never going to allow it to be shown in its current state. Your only hope is that he'll take it and remake it into a work that he will allow to be shown. What is your recommendation to the curator as conservator in that case?

Carol Mancusi-Ungaro: Assuming there's a fair amount of time that's passed here for the work to have collapsed, you stand the risk of getting a completely different work from this artist, even if he's trying to rework it. I think you're commissioning a new piece.

Kirk Varnedoe: Fifty years down the road, would people who are interested in this artist rather have the collapsed wreck of the thing that would tell them something—or would they rather have it redigested into a new, late work?

Jim Coddington: The standard conservator's response to any question is, "Well, it depends." And it really does. Even in the case of collapsed sculpture, there may be, even in that collapse, some statement of what the original was about.

Jeffrey Levin: *You all seem to be saying that it's difficult to draw any hard-and-fast rules. You have to look at each piece individually and evaluate what you think you know about the artist's intent. But what we haven't addressed is that the artist's intent at the age of 27 may be different from his or her feelings about it later, at the age of 53 or 72.*

Kirk Varnedoe: You said a mouthful. That's absolutely true.

Jim Coddington: Right. That's why I said that if Eva Hesse had not died young, perhaps her opinions on her work, which inform the decisions we make, may have changed. But it's the best information we have to go on, and it's darn good information.

Carol, not that long ago a great deal of effort was expended by you and others to get people to accept some level of change in contemporary art. In a sense, it was no different from old masters, where change was accepted. But now we're seeing a complete acceptance of change, and even identifying the work with all of that change—thus preventing, maybe, a conservator from stepping in. Are you noticing that?

Carol Mancusi-Ungaro: To a degree. I think what you're asking is if we are accepting too much change.

Jim Coddington: Yes—and even beyond conservators, hearing art historians, curators, and scholars saying, "Oh, yes, well, that's just a function of change. Don't worry about it."

Kirk Varnedoe: What Jim is describing is true, and let me give an example from another field. When I went to the Maya ruins of Tikal in Guatemala, many of the things that we looked at had been rebuilt from rubble. But the thinking now is that if an arch that had been standing ever since you'd been there—you have photographs of it—falls down tomorrow, you don't put it back up. Even if you know exactly how it would go back up. That's the moral injunction of this "hands-off, change-happens" ethos. That's exactly how it was explained to me.

Jim Coddington: But I think that gives a certain amount of credit to the person who goes there to use their imagination and to envision it. And having gotten a photograph, they could then say, "Gee, it would occupy space in this way."

Kirk Varnedoe: There's a big difference between walking over a pile of rubble and walking under an arch.

Carol Mancusi-Ungaro: I think that leaving a pile of rubble goes counter to our whole profession. We're here to preserve, in some measure, what we have.

Jim Coddington: Yes, but what about reconstruct? There's a difference between preserve and reconstruct.

Kirk Varnedoe: Ah, there is a line that I'd hate to parse.

Carol Mancusi-Ungaro: All right, reconstruct with the same materials and you have photographs and you know how it was. Yes, I would consider that a restoration.

Jeffrey Levin: *And that would be okay?*

Carol Mancusi-Ungaro: For me, it would.

Kirk Varnedoe: A restoration as opposed to a reconstruction?

Carol Mancusi-Ungaro: Yes.

Jim Coddington: The history of architectural restoration is rife with lots of potent and opposed points of view. One guy just flat-out reconstructs a cathedral, and the other guy says, "You can't possibly reconstruct these things. You don't have the mind-set of somebody from the medieval era to be able to reconstruct that." Viollet-le-Duc reflects the first approach, and William Morris the second. Morris, and others, aestheticized ruins in order to provide a further basis for letting them stay as is.

Kirk Varnedoe: Yes, and I think I was approaching something perilously close to that when I talked about the idea of not liking remade things, but liking the dings and scratched-up things because they told a tale of history that had gone along with it.

Jim Coddington: And that is a legitimate value to assign to it.

Kirk Varnedoe: The trouble is that when you mention the word *original,* I hear the cash register ring. Sometimes the decisions are made by people who have huge financial investments in the acceptance of a work as being the work of that artist, despite the amount of reconstruction or restoration that's gone into it. The pressures on all of these decisions by our society's valuation of authenticity is the ghost that's been flitting around this conversation.

Jim Coddington: You know, after lots of works in an artist's oeuvre have been restored to varying degrees, let's say you come up with one in pristine condition, truly untouched. It's going to look like the oddball—the one that doesn't look authentic.

Kirk Varnedoe: If we found an original piece of Greek sculpture with its polychromy still on it—boy, would it look weird.

Jim Coddington: Exactly. And this leads me to documentation, which is one of the great needs in the field. Documenting the intention, to whatever extent we can. Documenting the materials. Technology gives us the ability to do a much better job of documenting colors and the three-dimensionality of things. In trying to resolve some of the debates that we are having now—"How far do you restore it to?"—we can at least give some tools to future generations by addressing these issues specifically.

Carol Mancusi-Ungaro: I absolutely agree. The best we can do is to make sure that our documentation is as precise as possible to give some notion of how the work of art appeared, at least in our time.

Kirk Varnedoe: Technology does allow us to be more exact about any number of things that formerly escaped the net of reference. Being able to describe the surface of a painting in terms of its depth and relief—which you can now do with scanning—is a very useful thing to pass on to someone in the future so that they can measure change. Exactitude is within our grasp, making it possible for the future to make better-informed choices than we're able to make.

Jim Coddington: Part of this is the kind of conversation where you talk about why you made a decision. We routinely include that sort of information in our conservation treatment reports now. Why we *didn't* do something may be just as important as why we *did* do something.

Kirk Varnedoe: We're much more conscious of our fallibility. The imperative now is to make reversible decisions, so that in 20 years, if someone thinks that you shouldn't have overpainted an area, they can get that overpaint off. That's a kind of prudent humility that we've adopted, which I find altogether appropriate and generous to our successors.

Carol Mancusi-Ungaro: Reversibility is very important, especially for those of us working with unknown or industrial materials. I recently had access to a conservator's records of many years ago, and I was astounded at the value of his handwritten notes and notes on conversations that he'd had with the artist. It pleases me that in our treatment reports, there is now more about judgment—"I'm thinking of doing this" or "I chose to do this because . . ." That's very important information for the future.

Kirk Varnedoe: We all know of cases where restorers thought of themselves as alchemists in the old guild sense, and no one was allowed to know what technique was used. Those days are past, thank God. It's become a much more ethical business. We have a keenly developed historical sense, in terms of an awareness of past mistakes, a sense of our fallibility, and a need to provide the maximum amount of information and flexibility to those who'll follow us.

Jeffrey Levin: *And that represents a historic shift?*

Kirk Varnedoe: It seems to me that it's a new consciousness that's evolved within my lifetime.

Jim Coddington: Yes—and it is probably a result of a series of historical phenomena, not the least of which is the rise of museums.

Carol Mancusi-Ungaro: And also organizations of conservators sharing ideas and recognizing, as a profession, that sense of fallibility.

Jim Coddington: Yes. However, a recognition of fallibility should not be used as a reason never to intervene. It just means that one needs to intervene with a kind of self-consciousness, rather than a sureness of one's infallibility—or maybe with a sureness *of* fallibility.

Modern Paints

A New Collaborative Research Project

By Thomas Learner, Michael Schilling, and René de la Rie

Ever since the successful modification of cellulose nitrate into a form that could be used as a paint binder in the late 1920s, modern and contemporary artists have benefited from the availability of the vast range of commercial paints introduced throughout the rest of the century. Acrylic solutions, acrylic emulsions, vinyl emulsions, alkyds, and nitrocellulose are a few of the many important types of synthetic resins to have been used in artists' paints, as well as in household and other industrial paint formulations. Interviews and other documentary sources confirm that all of these synthetic paint types have been utilized by many 20th-century artists, including those as influential as Francis Bacon, Richard Hamilton, David Hockney, Roy Lichtenstein, Pablo Picasso, Jackson Pollock, Bridget Riley, Mark Rothko, Frank Stella, and Andy Warhol.

Nevertheless, knowledge regarding how well any of these modern paint media will withstand the passing of time remains extremely limited. It is improbable that any artists' material will be completely resistant to deterioration. Research is therefore needed to determine the likely extent of this deterioration and whether it could be classed as "catastrophic" (such as the powdering of early cellulose plastics) or as "tolerable" (as in the oxidation and subsequent cracking of oil paints). By starting to research these questions now, the art community has an excellent opportunity to assess many of the potential problems before they appear on works of art and, consequently, to develop the necessary preventive measures to keep our modern collections in a near-pristine state.

Designing the optimum means for the preservation and restoration of works of art is an extremely complex task that requires a comprehensive understanding of all the materials with which they were made and of the way in which these materials react with one another, with environmental conditions, and with conservation treatments. This information can be obtained only by thorough monitoring of objects and extensive programs of analysis and examination of test materials subjected to artificial aging and/or trial treatments.

A new integrated collaborative project—initiated in 2002 by Tate in London, the National Gallery of Art (NGA) in Washington, D.C., and the Getty Conservation Institute (GCI)—will work to answer some of the many questions that we have about the character of modern paint materials. This project brings to bear extensive scientific expertise and equipment in the areas of materials identification and cleaning, with each organization concentrating on research for which it has appropriate experience and facilities. Throughout the course of the project, occasional exchanges of staff among the institutions will foster new ideas and make efficient use of available resources.

The project will focus on three main areas: cleaning of modern paintings, chemical analysis, and physical characterization.

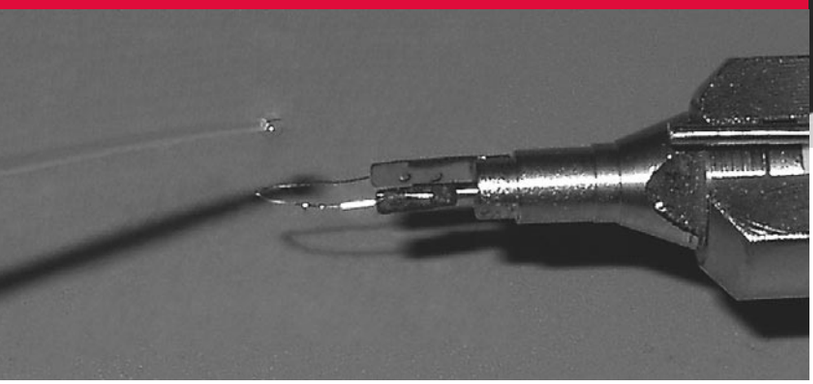
Cleaning—usually meaning the removal of surface dirt and/or a picture varnish from the surface of a paint film—is arguably the most routine treatment carried out on painted surfaces. Although much is now known about the relative efficiency and safety of various cleaning techniques for traditional oil paints, an equivalent awareness of their effects on modern and contemporary works of art, especially those executed with synthetic paints, does not yet exist. Research into cleaning modern paints is therefore urgently required, in particular to find effective methods for removing surface dirt (the majority of modern paintings are not varnished) and to evaluate the possible consequential long-term damage to the paint film as a result of cleaning.

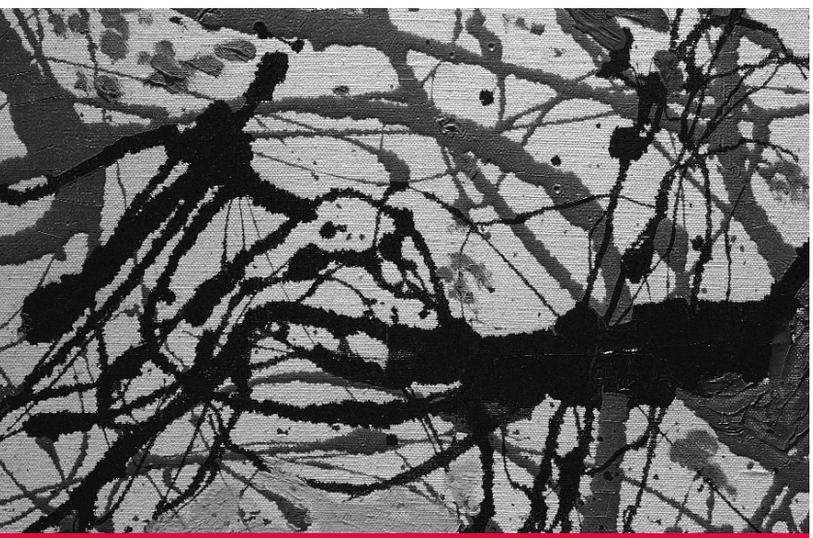
As part of the collaborative project, a comprehensive study on the cleaning of modern paints, including an assessment of the efficiency and safety of all methods and techniques currently used by conservators of 20th-century paintings, will be conducted at Tate, initially supported by funding for two three-year fellowships from the Leverhulme Trust and the Deborah Loeb Brice Foundation. One goal of this study is to establish rational criteria for the selection of specific cleaning processes. Aqueous and dry cleaning techniques will be highlighted, but some novel treatments currently under development will also be considered, including the use

Left: Thomas Learner, a paintings conservator and conservation scientist at Tate Modern in London, examining dried samples of modern paints that he has brought to the GCI labs to be analyzed. *Photo:* Marcelo Coelho.

Right: GCI senior scientist Michael Schilling preparing a sample from a dried acrylic paint medium, to be analyzed for its water-extractable components. The testing is done using a high-resolution mass spectrometer, also seen here. *Photo:* James Druzik.

Below: Detail of a sample being applied to the mass spectrometer's temperature probe. *Photo:* James Druzik.





Below: Jackson Pollock, *Summertime: Number 9A,* 1948, and a detail *(above)* of the painting. Oil, enamel, and house paint on canvas. The GCI has analyzed samples from other paintings by Pollock to identify the binding media. Pollock was known to use both artists' tube paints and ordinary house paints. The GCI studies were able to establish which of the two types of paints were present in the paintings studied. Photography © Tate, London 2002. © 2002 The Pollock-Krasner Foundation/Artists Rights Society (ARS), New York.

of lasers, enzymes, and liquid carbon dioxide. Potential changes to optical properties (gloss, color, and surface texture), physical properties (strength, hardness, and brittleness), and chemical properties (removal of components) of various modern paints by selected cleaning methods will be measured.

The NGA, with funding for a fellowship from Golden Artist Colors, will work closely with Tate on the cleaning study and will initially examine the likelihood and nature of materials that could be extracted from modern paints during these cleaning processes. For example, modern acrylic emulsion paints may contain 10 or more components (often called additives) that may be retained in the dried paint film. Removal of these components may affect the stability of the paint, its strength, or its tendency to crack and deform. In addition, changes in the composition and properties of the paints as a result of aging and cleaning will be investigated. At the GCI, supplemental studies of solvent extracts will be carried out with high-resolution mass spectrometry (MS), a research tool capable of detecting a broad range of materials.

Another component of the collaborative research project focuses on chemical analysis. The ability to establish the type of paint on a work of art is essential to an understanding of how it might alter in response to age, environmental conditions, or conservation treatments. The Conservation Department at Tate has been at the forefront of international research efforts to

A sample of assorted artists' materials in the National Gallery of Art's reference collection, along with paint-outs of materials, for testing purposes. To date, over 15,000 products have been catalogued in the reference collection. *Photo:* Michael Skalka, National Gallery of Art, Art Materials Collection and Study Center.

improve identification of the components of paint media used in modern and contemporary works of art. Major advances have been made in the development of analytical techniques for identifying synthetic paint media, such as pyrolysis–gas chromatography–mass spectrometry (PY-GC-MS) and Fourier-transform infrared spectrometry (FTIR).

These analytical tools can tell researchers what materials are present in mixed paint media. But to determine the proportions of each substance, one must rely on quantitative analytical techniques. Because it is unlikely that any single quantitative test will be equally effective on all types of modern paint media, an alternative approach to quantitative analysis is to apply a suite of test methods, each of which is designed for a specific class of paint medium. Initial research at the GCI will focus on development of a quantitative analysis procedure for oil-based modern paints, such as alkyd formulations, natural oils, and water-miscible oil media. GC-MS protocols developed at the GCI for identification of traditional paint media will be evaluated for use on modern oil-based media, and modifications to PY-GC-MS procedures will also be considered. In subsequent phases of the research, tests for the other major classes of paint media will be developed.

A third element of this collaborative project is to develop a more comprehensive understanding of how paint films respond to fluctuations of temperature in their environment. Synthetic paint media may expand, soften, and even become slightly sticky upon heating and, conversely, turn extremely brittle at lower temperatures. Such changes in a paint's physical properties may strongly influence phenomena such as rates of soiling, extent of cracking, and cupping of its surface; changes are probably also affected by the presence and nature of pigments and diluting agents, exposure to light, and the age of the material. Research into these phenomena will be conducted at the GCI and Tate utilizing thermal analysis instrumentation, a set of tools that provides in-depth information about polymers, plastics, and other organic materials.

The combined results from each component of the project will assist conservators in selecting appropriate cleaning methods and techniques for modern paints, increase our understanding of the problems that may develop over time as a result of the additives in some commercial paints, and help guide treatments of paintings composed of modern oil-based media. In coming years, the project may adapt the techniques used in this research to develop a similar understanding of other kinds of paint media, such as nitrocellulose and vinyl emulsions.

Works from the 20th century represent the artistic legacy of our time. In order to pass along these works to future generations, it is essential to understand as comprehensively as possible the factors that could contribute to their deterioration. By beginning this kind of research now, we are in a better position to anticipate deterioration problems with the materials used in the art—and that knowledge, in turn, can help us promote measures to preserve and protect the work well into the years ahead.

Thomas Learner is a paintings conservator and conservation scientist at Tate Modern in London. Michael Schilling is a senior scientist and head of the analytical research section at the GCI. René de la Rie is the head of scientific research at the National Gallery of Art in Washington, D.C.

Conserving the Buddhist Wall Paintings at Mogao

By Francesca Piqué

Detail of the wall paintings in Cave 85 of the Mogao grottoes, where the GCI is collaborating with the Dunhuang Academy on a wall paintings conservation project. The rock temples of Mogao were created by carving into the soft conglomerate rock cliff face and plastering the walls with a mixture of local clay, sand, and hemp fibers. To prepare the surface for painting, a second layer of finer clay plaster was applied, and over this, a thin white colored ground was added. Line drawings were made over the ground to outline the figures; mineral and organic colors were added later. *Photo:* Francesca Piqué.

Far to the west of Beijing, in northwest China, lies the oasis of Dunhuang, for a thousand years a major stop on the Silk Road. For travelers headed west, it was at Dunhuang that the Silk Road split in two. One route curved north and the other curved south, both moving along edges of the large and stark Taklamakan Desert. From the 4th century to the 14th century, Dunhuang was an important place for travelers to pray for a safe trek along this unforgiving desert—or to give thanks for having successfully arrived.

Along the Silk Road moved not only coveted goods but also ideas—among them Buddhism, which spread throughout China—and Mogao, on the outskirts of Dunhuang, became a site of Buddhist worship. Beginning in the 4th century, hundreds of cave temples were carved into one and a half kilometers of cliff face at Mogao, ranging from small decorated niches to large ornate chambers. The walls of the chambers were adorned with wall paintings, and many housed polychrome sculptures.

By the 14th century, safer and faster travel by sea—as well as political instability along land routes—caused traffic along the Silk Road to decline, and eventually the Mogao site was abandoned. Toward the end of the 19th century and into the early 20th century, the grottoes were "discovered" by explorers from the West and Japan. Today the site is managed by the Dunhuang Academy, established a half century ago and dedicated to the preservation and study of the grottoes.

The cave temples are now the focus of national and international tourism, attracted by Mogao's artistic, historic, and religious importance (see *Conservation,* vol. 14, no. 2). The site—a kind of archive of medieval Buddhist art—includes almost 500 painted caves with over 45,000 square meters (484,000 square feet) of wall paintings and over 2,000 sculptures. Having survived for centuries in Mogao's dry climate, this art nevertheless continues to require constant attention and research in order to address inevitable and ongoing deterioration.

Since 1989 the Getty Conservation Institute and the Dunhuang Academy have collaborated on conservation at Mogao, initially focusing on general site-related conservation issues. That effort resulted in improved conditions at the site, including a dramatic reduction in the amount of sand being blown into the caves from the cliff face above (see *Conservation,* vol. 9, no. 1).

Beginning in 1997, one aspect of the collaboration has concentrated on the conservation of wall paintings. The objective of the current wall paintings project is to develop approaches that would have wide applications not only at Mogao but also at similar sites on the Silk Road.

An Integrated Approach

The most effective approach, especially in a site the size of Mogao, is preventive conservation—which addresses the causes of deterioration—in addition to remedial conservation, which simply repairs damage. This approach requires an understanding of the causes and nature of ongoing deterioration, developed through a thoughtful integration of science and conservation.

Cave 85 at Mogao was selected as the collaborative project's model site for wall paintings conservation. This large 9th-century Tang dynasty cave was constructed for religious purposes and as a shrine to the local and powerful Zhai family. Within the cave are approximately 350 square meters of painted surface. The paintings

have extraordinary artistic, cultural, social, and historical value, and they provide an illustrated encyclopedia of everyday life during the Tang dynasty. The cave was selected because its wall paintings suffer from many of the typical problems found throughout the site.

An essential and critical step in the project has been to assess the condition of the wall paintings through a detailed study of the cave to identify and record the type and distribution of deterioration. The identification of ongoing (or active) deterioration was helped by comparing historical photographs of the cave, taken by the Dunhuang Academy in the past 50 years, with the current condition of the wall paintings. Visible changes indicated areas of recent and, most likely, active deterioration. The assessment of the cave's condition shows that the detachment of the painted plaster from the conglomerate rock is an active and considerable problem, often resulting in the collapse and destruction of a portion of the paintings.

Understanding the causes and the mechanism of this ongoing deterioration requires interdisciplinary diagnostic investigations. These include the collection and study of conservation, analytical, and environmental information that is used to formulate hypotheses regarding the deterioration and to develop recommendations for interventions.

Diagnosis at Cave 85 began with the study of the active deterioration, the form it takes, and its distribution throughout the cave. Scientific investigations were necessary to understand the physical and chemical composition of the original materials and of the materials affecting the painting—in Cave 85, these were soluble salts in the rock and plaster and, in certain areas, polyvinyl acetate used in previous conservation interventions. Environmental monitoring carried out over the years provides an understanding of the fluctuations of humidity and temperature surrounding the paintings and at the site.

Causes of Deterioration

Since 1997, GCI and Dunhuang Academy staff have worked in their laboratories and in Cave 85 to collect information and carry out tests to formulate and confirm hypotheses on the causes of deterioration. While the project is not complete—and some results need to be confirmed—a mechanism has been theorized as responsible for the ongoing deterioration in Cave 85. The active detachment is concentrated mainly on the cave's west wall and the west portion of the north and south walls and ceiling. Analytical study showed that, as expected, the distribution of deterioration corresponds to earthen plaster zones with large amounts of soluble salts in the plaster, mainly sodium chloride, naturally present in the conglomerate rock walls. The areas affected by deterioration contain almost 10 times more soluble salts than areas in good condition.

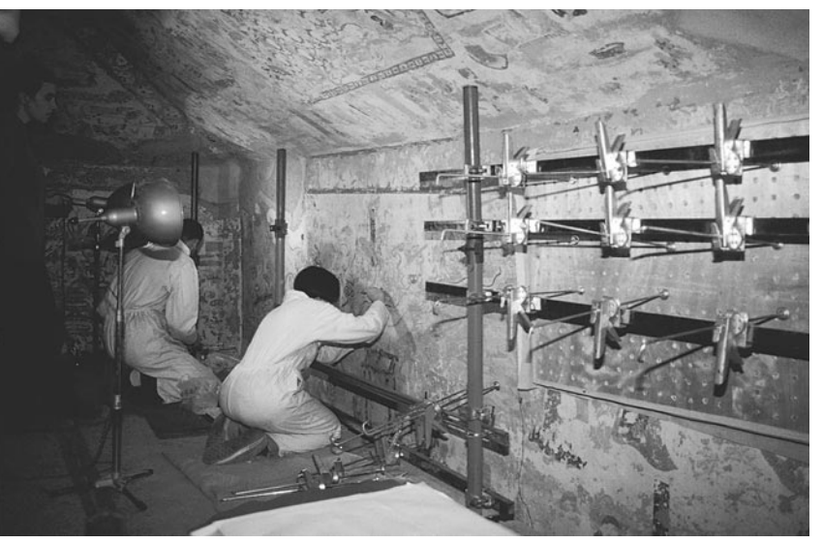
Although the environment at the site is generally quite dry, when it rains, the humidity rises and the salts in the walls absorb moisture in the air through a phenomenon called hygroscopicity. The resulting salt solution can move through the porous earthen plaster. When the climate returns to its typically dry condition, the salts crystallize, causing detachment of the painting or the formation of losses in the paint layer (depending on where in the painting stratigraphy the crystallization occurs). The physical history of the site lends support to this hypothesis, because most recent plaster losses, in this and in other caves, have occurred following periods of rain. This hypothesis is related to atmospheric humidity. Another salt activation mechanism may be linked to the migration of moisture vapor from the body of the rock.

To remove or to significantly reduce this cause of deterioration, the team has been working on a salt extraction process, combined with conservation intervention. Obviously the soluble salts present in the conglomerate rock cannot be completely removed; in addition, poulticing of salt can be dangerous to the earth-based and water-sensitive paintings. The team is also working on improving the sealing or closing of the cave entrance, in order to reduce fluctuations of the cave environment related to the rain by preventing humid air from entering the cave. The GCI and Dunhuang Academy team is currently studying this intervention and its consequences.

Understanding the causes and mechanism of deterioration is critical for development of effective conservation treatment. In particular, it is important to know if the causes of deterioration can be completely eliminated or only mitigated. For example, the intervention of grouting—defined as the introduction of material with adhesive and bulking properties into a void—was designed with a consideration of the substantial quantities of salts present in the plaster and the conglomerate rock. The reattachment of the earthen plaster rich in soluble salts must be done with materials compatible with the original, using minimal amounts of water, an

Left: A recent plaster loss. Detachment of the earthen plaster has been a long-term problem at Mogao. In the past, cross bracings of metal or plastic strips were used to hold the plaster in place. This method, however, did not solve the problem, and losses continued to occur. *Photo:* Francesca Piqué.

Below: Two views of Mogao project team members injecting adhesive grout to reattach wall paintings. Special presses hold the plaster in place as the grout sets and dries. The grout, developed through extensive laboratory and in situ testing, is composed of local earth (the same type used to create the paintings) and lightweight components to prevent further weight-related stress on the paintings. The addition of small amounts of egg white increases the adhesion property of the grout, as well as its fluidity and lightweight properties. *Photos:* Neville Agnew and Francesca Piqué.



appropriate application method, and, most important, an absorbing system to capture the salts mobilized by treatment. In addition, the set grout must have characteristics compatible with those of the original earthen plaster. After extensive laboratory and in situ testing, the project team developed a grout with the desired properties that has been used since April 2002 to reattach the paintings.

Following emergency stabilization of the paintings with Japanese paper and supporting presses, an important aspect of the treatment process has been the development of an absorbent system that extracts salts mobilized by the water and ensures that as little as possible remain in the paintings. Testing has included the use of simulated plaster panels artificially contaminated with salts to evaluate different absorbent systems and to assess the distribution of soluble salts before and after grouting combined with poulticing.

Applicable Results

Although not completed, the collaborative project on the wall paintings at the Mogao grottoes has already provided important preliminary diagnostic results on the causes and the mechanism of deterioration, as well as on the stabilization treatment of the paintings. The combination of soluble salts in the plaster and rock and the humid air formed during rain events appears to cause the deterioration of the wall paintings. This mechanism is probably common to numerous sites on the Silk Road, and mitigation measures will therefore have wide applicability. Similarly, the methodology adopted to develop the adhesive grout mixtures for the salt-laden plasters in Cave 85 may be generally applicable to other similar sites.

This project is an example of the importance of combining conservation and science for diagnostic investigation with the planning of interventions. Unfortunately, a characteristic of in situ conservation is that the causes of deterioration cannot always be eliminated—only reduced. With deterioration still active, it is clear why, in the field of in situ conservation, a project is never really considered completed; regular monitoring and maintenance are required.

The preliminary results of the project will be presented at the international conference "Conservation of Ancient Sites on the Silk Road," to be held at the Dunhuang Academy in August 2003. On this occasion, Cave 85 will be open so that delegates may visit the conservation site, examine its problems, and view at close range the remarkable wall paintings that tell us so much about life in a distant time.

Francesca Piqué is a project specialist with GCI Field Projects and the head of the project conservation team at work at Mogao.

Project Updates

Joya de Cerén Management Plan

In the summer of 2002, the Getty Conservation Institute and the Consejo Nacional para la Cultura y el Arte (Concultura) of El Salvador completed the management plan for the World Heritage Site of Joya de Cerén, a pre-Hispanic Maya farming community buried by volcanic eruption about 1,400 years ago.

In July 2002, the GCI and Concultura presented the plan to the vice president of El Salvador and to the mayor of San Juan Opico, the municipality in which the site is located. Also attending the ceremony were members of the local community and representatives from Salvadoran national agencies.

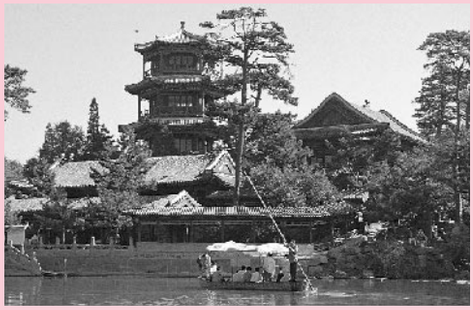
The vice president of El Salvador addressing those gathered for the presentation of the Joya de Cerén management plan—a four-year collaborative effort of the GCI and Concultura. *Photo:* Lucia Valero Martin.

The management plan is the result of a four-year collaboration of the GCI and Concultura to adapt a methodology developed by the Institute to a specific plan for Joya de Cerén (see *Conservation,* vol. 16, no. 1). Created using a values-driven process, which included the participation of a wide range of interest groups, the plan's approach is intended as a model for the management of other sites in the region.

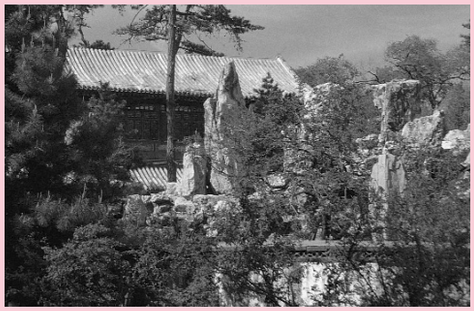
In addressing the specific needs and potential of the site, the plan considers four major programs: investigation, conservation, landscape (both the site's physical aspect and its surroundings), and human development (community impact, education, and tourism). The resulting document is an integrated and sustainable conservation management plan that approaches the site's condition in relation to its natural and social context. It integrates all future activities at the site and constitutes a framework for reconciling private and institutional interests—thereby ensuring conservation of the values and significance of the site, as well as optimizing the appropriate use of all human and financial resources.

The Institute will continue working on the conservation strategy for Joya de Cerén, including defining parameters for its protective shelters.

China Principles Project at Chengde



The lake and pavilions within the Imperial Summer Mountain Resort at Chengde. *Photo:* Martha Demas.



The Wenjin Library at Chengde. *Photo:* Neville Agnew.

Chengde's official name, the Imperial Summer Mountain Resort, belies the important political functions it served for two centuries, as well as its role in China's international relations in the 18th and 19th centuries. It was to Chengde—lying beyond the Great Wall of China 115 miles north of Beijing—that the Manchu emperors of China's Qing dynasty retreated during the hot summer months. Founded in 1703 by Emperor Kangxi, it was completed by his grandson Qianlong in 1792.

The colossal site is ringed by a seven-mile wall, within which is a mountainous area and a largely artificial landscape of lakes and parkland, with complexes of pavilions located at the emperor's favorite scenic spots. Immediately outside the wall are eight temples, including a scaled-down version of the Potala in Tibet.

In the early 20th century when the 300-year-old Qing empire collapsed, Chengde was abandoned. Decades of turmoil, occupation, and civil war followed. Chengde remained in disrepair until the 1970s, and few visitors to China knew of its existence. Now on the World Heritage List, sections of the resort have recently undergone extensive restoration. As tourism to China continues to expand, Chengde is in need of a plan to guide its future use and conservation.

The GCI and the Chengde Cultural Relics Bureau (CCRB) are applying the China Principles—national guidelines for the conservation and management of cultural heritage sites in China—at two significant building complexes at the resort. The China Principles, developed by China's State Administration for Cultural Heritage (SACH) and the GCI, in collaboration with the Australian Heritage Commission (see *Conservation,* vol. 16, no. 2), were formally approved at Chengde in September 2000, under the auspices of China ICOMOS and with the approval of SACH.

The buildings selected for implementation following the Principles methodology are the Wenjin Library and the Shuxiang Temple. The Wenjin Library is located within the walls of the resort. This royal library, one of seven in China, housed books compiled under the supervision of the court. Currently, parts of the complex are used as studios by local artists. The Shuxiang Temple, constructed in 1774, is based on the Manjusri Temple in Mount Wutai, Shanxi Province. It was the only temple at Chengde to house Manchu lamas, and it was also known as the family temple of the Qing court. Only three of the original buildings remain: the gate, the main temple, and a small pavilion (recently restored by the CCRB) behind the main temple.

Preliminary work was done in 2001 on a draft master plan for the site as a whole. In May and October 2002, the CCRB, the GCI, and the Australian Heritage Commission developed the plan further. Using the analytical assessments and decision-making process of the China Principles, the collaborative team is determining the approach to conservation, restoration, visitor management, future use, and the technical and research issues that need to be addressed. Upon final approval by SACH, the CCRB will progressively implement the plan over a 10-year period. As part of the strategy to ensure widespread adoption of the China Principles, the approved master plan for the Summer Resort of Chengde will be disseminated by SACH to provincial and municipal bureaus to serve as a national model for the preparation and structure of site plans. The project is expected to be completed by 2005, when China ICOMOS hosts the International Congress of ICOMOS.

Mosaics Experts Meeting

Participants from the experts meeting examining a mosaic at the archaeological site of Paphos, Cyprus. *Photo:* Martha Demas.

Last June, in conjunction with the GCI's Mosaics In Situ project, the Getty Conservation Institute and the Archaeological Research Unit of the University of Cyprus organized a meeting of international experts on the conservation of ancient mosaics. Held in Nicosia, Cyprus, the four-day meeting was attended by 23 professionals from 11 countries.

The purpose of the meeting was to bring together professionals with an interest in the conservation of ancient mosaics to discuss existing needs in the field, as well as current initiatives and opportunities for fostering research and establishing collaborative projects.

Structured around four major themes—inventory and documentation; characterization and causes of deterioration; maintenance, treatments, and protective interventions; and training and awareness—the meeting provided an opportunity for professionals and organizations involved in mosaics conservation to explore forging stronger relationships and working in a more integrated way.

At the meeting, participants drafted a statement for dissemination that included the following:

> Mosaics represent one of the few polychromatic artistic achievements to survive from antiquity. There exists a consensus among professionals that they should be conserved in situ whenever possible; however, despite their apparent durability, mosaics are vulnerable to decay once exposed to the environment. Insufficient attention has been paid to the special conservation and long-term maintenance needs of excavated mosaics and as a consequence, mosaics are rapidly deteriorating and many are in danger of total loss.
>
> To address these concerns, the meeting participants urge government authorities and others with responsibility for the protection and care of mosaics to consider the following actions:
>
> - Excavation of further mosaics should only be sanctioned in circumstances where their immediate and ongoing conservation can be assured.
> - Basic documentation of mosaics, including a condition and risk assessment, should be undertaken at a national level.
> - Maintenance should be given the highest priority, and consideration should be given to the reburial of mosaics that are not being actively maintained.
> - Training for those involved in the management or conservation of mosaics should be improved, and awareness of the importance and rapid loss of mosaics should be heightened among government authorities and the public.
> - Further research should be undertaken into the causes of deterioration and methods of conservation of mosaics.

The GCI's Mosaics In Situ project, which addresses a number of important issues related to the conservation and management of ancient mosaic pavements in situ, will base its future activities on these recommendations and will work collaboratively with other individuals and institutions to pursue these common goals.

Latin American Consortium

In June 2002, the GCI and the Pontificia Universidad Católica de Chile hosted a reunion of the Emergency Plans working group of the Latin American Consortium (see *Conservation,* vol. 15, no. 2). The goal of the Consortium is to enhance preventive conservation by strengthening the existing capabilities of member institutions in designing and implementing training in this area.

The June meeting was a follow-up to a June 2000 workshop—coorganized by the GCI—entitled "Future Instructors in Emergency Plans," held in Santiago, Chile, as part of the Emergency Plans working group. At that workshop, 24 participants representing five Consortium member countries—Argentina, Brazil, Chile, Colombia, and Cuba—received training in the emergency planning process, in the use of didactic materials, and in interactive teaching methodologies. At the conclusion of the workshop, members agreed to continue working collaboratively to develop and share didactic materials and to implement training and advocacy activities in their respective institutions, regions, and countries.

The main objectives of the four-day June 2002 meeting were to allow members to present work undertaken since the 2000 meeting, to discuss challenges to their work and the solutions developed to overcome them, to present and review didactic mate-

rials, and to set in place measures to support the group's work in the long term.

In the two years since the initial workshop, group members have undertaken a number of emergency planning initiatives. These include local activities such as implementing the emergency plans process in cultural institutions; establishing links with important public-sector resources such as fire departments; and incorporating emergency preparedness activities, including field exercises, into preventive conservation training programs. At a regional and national level, members' activities include courses for cultural heritage professionals, articles and conference presentations on emergency plans, production of safety brochures, collaborative efforts to include cultural heritage buildings in national fire safety legislation, and implementation of an emergency plan process for the wooden churches of Chiloé, Chile. Sixteen of the Chiloé churches are on the World Heritage List.

To promote the continuation of the Emergency Plans working group, coordination of the group was transferred from the GCI to the Facultad de Restauración de Bienes Muebles, Universidad Externado de Colombia, Bogotá. The GCI will remain an active member of the Latin American Consortium and the Emergency Plans working group.

Training in Tunisia

A participant in the Tunisian technician training program sponging newly applied lime mortar to reveal the aggregate (or sand) within the mortar, creating a better overall appearance. *Photo:* Elsa Bourguignon.

This past spring, a fourth campaign of training in the maintenance of in situ archaeological mosaics was held at the site of Thuburbo Majus, Tunisia. A joint effort of the GCI and the Institut National du Patrimoine (INP), Tunisia, the training program is designed to address the need for mosaics maintenance at archaeological sites in Tunisia by training technicians to perform the everyday stabilization and maintenance work that in situ mosaics require. This training is part of a national strategy to safeguard Tunisia's archaeological heritage through the creation of maintenance teams based at sites in different regions of the country.

The first three training campaigns, which blended classroom instruction and hands-on practice, were held in 2001 at the site of Utica. In these sessions, the trainees learned the steps in the conservation process—from documenting the condition of the mosaics to planning treatment and executing the stabilization of the pavement (see *Conservation,* vol. 17, no. 1).

In May the training moved to the site of Thuburbo Majus. This final campaign for this group of trainees was aimed at reinforcing what had already been learned through work at a different site that posed new problems. Here the trainees gained additional experience in a number of techniques introduced briefly in previous sessions, such as grouting with lime mortar, and reburial, and they were given guidance in solving the most difficult maintenance problems at the site. They also reviewed and inspected the work that they had previously carried out at Utica—tasks that introduced them to the important maintenance activity of periodic inspection and condition assessment.

In recognition of the trainees' completion of the course, a group of archaeologists, architects, and administrators from the INP were invited to the site to view their work and to discuss with the trainees and the instructors a variety of mosaic and site conservation issues.

The GCI remains committed to working with Tunisia to achieve its goal of creating regional teams of maintenance technicians. To this end, in October 2002, the GCI and the INP began a second technician training course at the Roman and Byzantine site of Makhtar. At the completion of the training, this new group of trainees will carry out the maintenance of in situ mosaics in archaeological sites situated in the central region of Tunisia.

Upcoming Events

Fifth World Archaeological Congress

The World Archaeological Congress (WAC), a worldwide organization of practicing archaeologists, will hold its fifth international congress June 21–26, 2003, in Washington, D.C.

For this congress—the first in North America—the GCI is working with a consortium of conservation and cultural heritage institutions to develop conservation-related programming, with the aim of strengthening the relationship between the professions of archaeology and conservation. The theme of the programming is "Of the Past, for the Future: Integrating Archaeology and Conservation." Participating with the GCI in this initiative are the American Institute for Conservation of Historic and Artistic Works (AIC); English Heritage; the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM); the Institute of Archaeology at the University of London; the International Council on Monuments and Sites (ICOMOS) and two of its national bodies, US/ICOMOS and Australia ICOMOS; the National Monuments of Chile; the State Administration of Cultural Heritage of the People's Republic of China; the World Monuments Fund; and the World Tourism Organization.

Conservation-related topics will be addressed in a series of plenary presentations and panel discussions throughout the congress. The emphasis will be on global issues crucial to the survival of archaeological heritage in today's world. Among these are policy-based and social issues that counterbalance the traditional scientific and technical domains of expertise in archaeological conservation. Foremost among these are methodological site management planning and implementation, including management of archaeological World Heritage sites, as well as increased participation by indigenous peoples, communities, and stakeholders in decision making, in interventions on sites, and in determining the disposition of excavated objects. Other issues to be addressed include development and tourism, which present an ever-greater threat to the world's archaeological record in many countries. There will also be a panel on the impact of development on the archaeological heritage and conservation in China.

Held every four years, the WAC congress offers discussion of new archaeological research, as well as of archaeological policy, practice, and politics. For further information on the Fifth World Archaeological Congress, including registration details and descriptions of the conservation sessions, please visit the congress Web site www.american.edu/wac5 or contact:

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Tribute

Carolyn L. Rose

On August 29, 2002, after a long illness, Carolyn L. Rose passed away in Washington, D.C. She was 53.

Carolyn had a long and distinguished career in conservation. At a recent George Washington University (GWU) ceremony where she was awarded the President's Medal, GWU President Stephen Joel Trachtenberg described her as a "one-woman graduate school," a reference to the fact that she had taught or impacted the lives of many ethnographic and archaeological conservators.

Carolyn's career began in 1971, with a degree in art history from Sweet Briar College, and continued at George Washington University, where she earned her master's degree in 1976. Her involvement with GWU continued through its Museum Studies Program, which she established in association with the Smithsonian Institution's National Museum of Natural History, where she became senior research conservator in 1990 and chairman of the Anthropology Department in 2000. She received Exceptional Service Awards from the museum from 1996 to 1998.

The GCI benefited from Carolyn's expertise through her participation in various Institute advisory, planning, and training committees; through her contributions to *Conservation;* and through her support of *Art and Archaeology Technical Abstracts,* as both an adviser and a volunteer abstractor.

In keeping with her commitment to the profession, Carolyn was active in numerous organizations and committees. She served as chair of the National Institute for Conservation (now Heritage Preservation) from 1985 to 1989 and as chair of the Membership and Objects Specialty Groups of the American Institute for Conservation of Historic and Artistic Works (AIC). In 1997, AIC awarded Carolyn the University Products Award for distinguished achievement in the field of conservation. Carolyn was also president of the Society for the Preservation of Natural History Collections (SPNHC) from 1994 to 1995, and in 2001, she was awarded the SPNHC President's Award for distinguished service.

In addition to teaching, overseeing interns, organizing workshops and conferences, and reviewing grants, Carolyn also contributed to numerous books, conference proceedings, and journals.

Planning and Engineering Guidelines for the Seismic Retrofitting of Historic Adobe Structures

By E. Leroy Tolles, Edna E. Kimbro, and William S. Ginell

A companion volume to *Seismic Stabilization of Historic Adobe Structures: Final Report of the Getty Seismic Adobe Project,* this book offers guidance for planners, architects, and engineers in the retrofitting of historic and culturally significant adobe structures. The text outlines the fundamental conservation principles and preparatory steps in the design of a plan. Additionally, it describes the types of earthquake damage typically encountered in historic adobe buildings and presents detailed technical procedures for applying the appropriate retrofit measures. The book also includes a directory of pertinent government agencies, possible funding sources, an abstract of the California seismic safety code, an article describing historic adobe, and excerpts from the *Secretary of the Interior's Standards for the Treatment of Historic Properties.*

E. Leroy Tolles, a structural engineer with ELT & Associates, was principal investigator for the Getty Seismic Adobe Project (GSAP). Edna E. Kimbro is an architectural conservator and historian specializing in the preservation of Hispanic-era buildings and material culture. William S. Ginell is a senior scientist at the GCI and was project director of GSAP.

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The Use of Oxygen-Free Environments in the Control of Museum Insect Pests

By Shin Maekawa and Kerstin Elert

Museums throughout the world face the challenge of finding nontoxic methods to control insect pests. This book focuses on practical rather than theoretical issues in the use of oxygen-free environments, presenting a detailed, hands-on guide to the use of oxygen-free environments in the eradication of museum insect pests.

This volume discusses the use of nitrogen as the inert gas used to replace oxygen, as well as the use of a few specific types of containers as treatment chambers. An initial chapter explains the general advantages anoxia offers museum conservators. Subsequent chapters discuss methods and materials, small-scale anoxia using an oxygen absorber, large-scale anoxia using external nitrogen sources, and protocols for insect eradication using nitrogen anoxia. Appendices include a list of manufacturers and suppliers of material and equipment used in nitrogen anoxia.

Shin Maekawa, coauthor of *Inert Gases in the Control of Museum Insect Pests* and *Oxygen-Free Museum Cases,* both from Getty Publications, is a senior scientist at the GCI. Kerstin Elert is a research fellow at the University of Granada, Spain.

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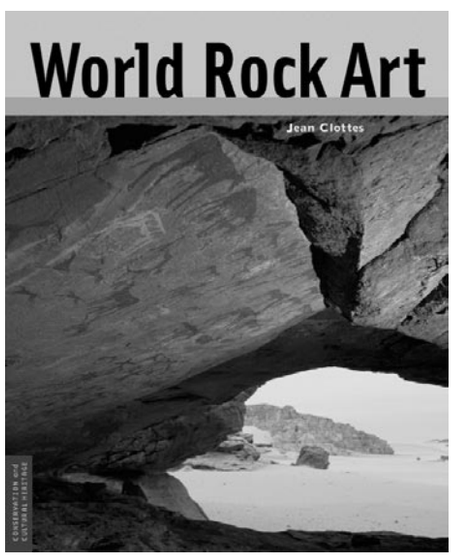
World Rock Art

By Jean Clottes

Although cave paintings from the European Ice Age have gained considerable renown, for many people the term *rock art* remains full of mystery. Yet it refers to perhaps the oldest form of artistic endeavor, splendid examples of which exist on all continents and from all eras. Rock art stretches in time from more than 40,000 to less than 40 years ago, and it can be found from the Arctic Circle to the tip of South America, from the caves of southern France to the American Southwest. It includes animal and human figures, complex geometrical forms, and myriad mysterious markings.



Illustrated in color throughout, this book provides an engaging overview of rock art worldwide. An introductory chapter discusses the discovery of rock art by the West and the importance of landscape and ritual. Subsequent chapters survey rock art sites throughout the world, explaining how the art can be dated and how it was made. The book then explores the meaning of these often-enigmatic images, including the complex role they played in traditional societies. A final chapter looks at the threats posed to rock art today by development, tourism, pollution, and other dangers and discusses current initiatives to preserve this remarkable heritage.

Jean Clottes, author of more than 15 books and 300 articles on prehistory and prehistoric art, is one of the world's leading experts on rock art.

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François LeBlanc

Head, Field Projects

Dennis Keeley

Matthew Nanni

General Services Assistant, Administration

Dennis Keeley

François LeBlanc has been the head of Field Projects for the GCI since 2001, overseeing projects in China, Honduras, El Salvador, Italy, and Tunisia, as well as initiatives in documentation and earthen architecture conservation.

Raised in the suburbs of Montreal in a French-speaking home—the son of a bank accountant and a French tutor—François at an early age displayed an interest in drawing. His mother and aunts played piano, so music was also a part of his childhood, and at 14 he took up the saxophone. In college he earned money playing with a rhythm and blues band that ultimately made a couple of commercial recordings.

But it was his interest in drawing that led him toward a career in architecture. After graduating from Montreal University with a B.A. in architecture in 1971—shortly after marrying and having the first of two children—he was hired by Parks Canada, where he was part of the organization's first preservation team. In 1975 he was appointed the chief of engineering and architecture for Quebec Region Historic Parks and Sites. Four years later the president of ICOMOS Canada (for whom he'd worked at Parks Canada) suggested that he apply for the directorship of ICOMOS in Paris. Hired in 1979, François spent four years with the organization, establishing the first formal set of guidelines for ICOMOS evaluation of nominations to the World Heritage List and developing a more extensive advisory role for ICOMOS with UNESCO.

Subsequently returning to Canada, François took a position as vice president of the Heritage Canada Foundation. There he concentrated on conservation programs, in particular the "Main Street Canada" program, which used commercial development to enhance architectural preservation in more than 100 small communities. But by 1992, he was eager to return to architecture and to travel less. That year he joined the National Capital Commission in Ottawa as chief architect, managing a number of architectural projects, many of which were national historic sites. After eight years with the commission, he came to the GCI out of a desire to be part of more international work devoted to conservation. Since taking over as head of Field Projects, he has found particularly exciting the site management planning effort at Joya de Cerén in El Salvador, the technician training initiative in Tunisia, and his advisory role with the current conservation initiative at the Taj Mahal.

In his spare time today, he plays billiards, frequently participating in amateur competitions.

Matthew Nanni is the GCI's general services assistant, providing general office support for the staff, including the purchasing and stocking of supplies.

Matthew's father—an Italian electronics engineer—met Matthew's mother—an American working in Holland for a record company—in 1960, and together they went to the United States the following year. Matthew was born three years later on Kwajelein Atoll in the Marshall Islands, where his father was then working as a contractor at the atoll's U.S. military tracking station. In Matthew's early childhood, the family lived in the United States, Britain, France, and Italy, coming home to stay in Massachusetts in 1969.

Music has always been a major part of his life. He remembers seeing the Beatles' film *Yellow Submarine* in Milan when he was four, which inspired an early love of music. His home was filled with music—his father liked opera and classical music, his mother loved jazz. Matthew took up the violin briefly in elementary school, and then, in the 8th grade, he bought an electric bass after listening to a lot of rhythm and blues and reggae. He started his first band shortly thereafter.

In the mid-1980s, Matthew attended the Berklee College of Music in Boston, and in the summer of 1988, he toured Tuscany with a band formed at school. Returning home, he worked at local music venues and private events. In 1992 he was hired as the bass player for an established group and again went on tour, this time to Spain and Norway. Back in Boston, he once more played with local bands, developing an interest in jazz and fusion.

By 1994 he wanted a change, and he moved to Los Angeles, where he quickly found work with the GCI. His involvement with music did not end, and in his first few years in L.A., he played with a number of bands at a variety of local venues. Between 1998 and 2002, he had a more regular group, which performed blues, rock, and jazz.

Matthew enjoys the balance of GCI work and music. He takes an interest in the progress of the Institute's projects and in the variety of people at the GCI—regular staff and visitors. At the same time, as part of his ongoing studies, he continues to spend a lot of time listening to music and transcribing recorded jazz and other styles of music for electric bass. He recently formed a jazz trio.