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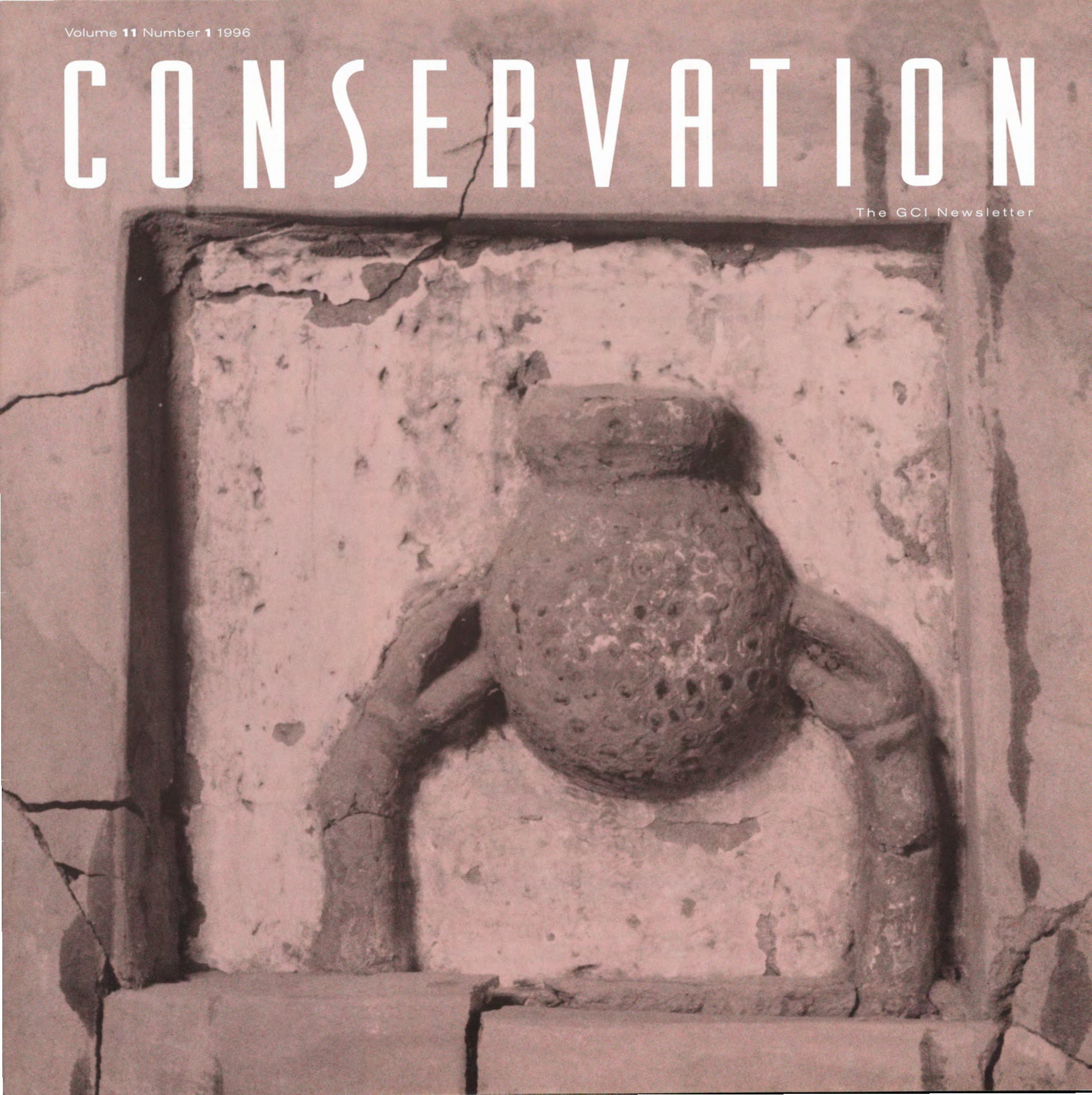
CONSERVATION

The GCI Newsletter



The Getty Conservation Institute Newsletter

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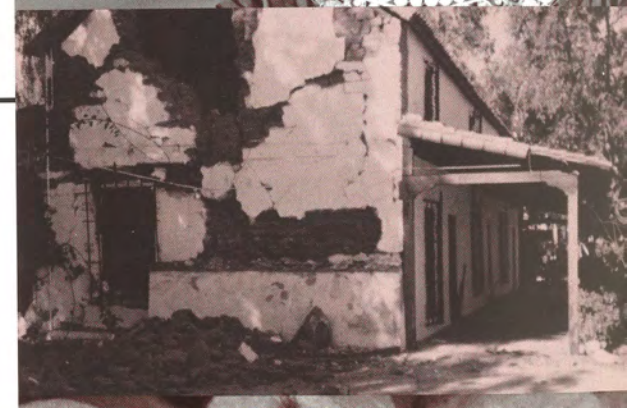
The Getty Conservation Institute is an operating program of the J. Paul Getty Trust. Other programs of the Trust are the J. Paul Getty Museum; the Getty Center for the History of Art and the Humanities; the Getty Art History Information Program; the Getty Center for Education in the Arts; the Museum Management Institute; and the Getty Grant Program.

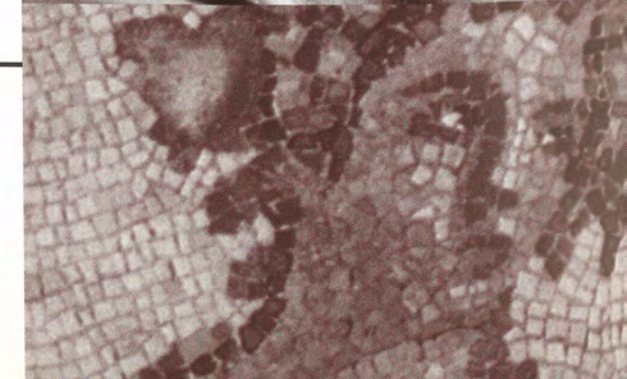
Conservation, The GCI Newsletter is distributed free of charge three times per year, in English and Spanish, to professionals in conservation and related fields, and to members of the public concerned about conservation. The GCI works to develop a broad constituency for conservation and to promote an international appreciation of the value of our cultural inheritance and our shared responsibility for its preservation.

The Getty Conservation Institute
4503 Glencoe Avenue
Marina del Rey, CA 90292 USA
Telephone: 310 822-2299
Fax: 310 821-9409

Front cover: **A damaged bas-relief from the Royal Palaces of Abomey. The bas-relief depicts an earthen jar pierced with holes held by two hands–a symbol of the call for unity by the king of Dahomey.** ***Photo:*** **Susan Middleton.**

Back cover: **Globe photo by Dennis Keeley.**





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CONSERVATION

History Told on Walls

By Francesca Piqué and Leslie Rainer

Bas-Reliefs of the Royal Palaces of Abomey

Of the many European travelers to the Kingdom of Dahomey in West Africa during the 19th century, explorer and writer Sir Richard Burton was one of the few to leave a detailed written record of his experience. In the 1860s Burton was sent by the British government to negotiate certain matters with King Glélé of Dahomey. From his account it is clear he was impressed with the Dahomey monarch's regal appearance and gracious demeanor. However, he also expressed frustration with the resistance of the king to diplomatic demands.

"The personal courtesies of the King," he later wrote, "compared badly with his stubborn resolve to ignore, even in the smallest matters, the wishes of Her Majesty's Government." King Glélé's assessment of Burton—according to Burton himself—was that he was "a good man, but too angry."

Given Dahomey's history, the king's refusal to be submissive in the face of another nation's dictates should not have been surprising. Dahomey was a politically powerful kingdom in its own right. Following its founding in the early 17th century, it acquired a military prowess that made it one of the richest and most powerful nations in West Africa during the 18th and 19th centuries.

This military might—based in part on companies of female warriors whose fierceness in battle equaled that of their male counterparts—enabled Dahomey to capture considerable numbers of prisoners of war. The kingdom's main source of wealth was the selling of these prisoners as slaves to Europeans eager for cheap labor to work the plantations and fields of the New World. Indeed, ending the traffic in slaves was one of the demands of the British. King Glélé's response to Burton was that the slave trade was an ancestral custom that had been established by the Europeans themselves, and he would continue to sell what the Europeans wanted.

Some of Dahomey's wealth went into the construction of royal palaces. Almost from the kingdom's beginnings, its rulers built earthen palaces in its capital, Abomey, in the heart of what is now the Republic of Benin. According to tradition, King Dakodonou constructed the first palace in 1645, and thereafter each king had his palace built near that of his predecessors.

Starting with the reign of King Agadja (1708–32), bas-reliefs were incorporated into the royal palace facades. Inset in niches in the walls, they were executed in semi-relief; their modeling was achieved by the addition of earth. Once dry, they were painted in bright colors made by mixing a variety of local products, including kaolin, palm oil, red and yellow ochre, and carbon black. (More recent repaintings have been done with modern paint materials.)

The bas-reliefs constituted an integral decorative feature of the palaces, illustrating the Fon people's rich cultural heritage, complex mythology, customs, and system of rituals. In pictorial form, they recounted the battles fought and the tortures to which enemies were subjected, glorifying the

victories and power of each king. Their function was to represent the significant events that marked the evolution and power of the Fon people and their kingdom. For a society without written documents, the bas-reliefs became an important and unique record of the past. "They are our only written history left," Benin historian Nondichao Bachalou has noted. "They are history told on our walls."

The palace bas-reliefs also depicted mythical and actual animals that symbolized the characteristics of the kings and their power as rulers. One of the animals most associated with the reign of Glélé (1858–89) was the lion. When Glélé's Adjalala, or official palace, was constructed, the lion was featured in 15 of the building's 56 bas-reliefs.

A century after his death, these bas-reliefs, which told the story of Glélé's achievements, have themselves become a story. Their conservation is presently the purpose of a special project being undertaken by the Getty Conservation Institute and the Republic of Benin.

The Royal Palaces

The Royal Palaces of Abomey, a UNESCO World Heritage Site, are composed of several earthen buildings covering an area approximately 44 hectares (190 acres) in Abomey. The entire site is still regularly used for traditional ritual activity and for ceremonies involving the royal family. Within the site is the Musée Historique d'Abomey, housed in the palace compounds of King Glélé and his father, King Guézo (1818–58).

Problems for the palace site began at the close of the 19th century, when France claimed Dahomey as a protectorate and the kingdom's dominance in West African affairs came to an end. When French forces approached in 1892, King Behanzin ordered that the city of Abomey—including the palaces—be burned, with the intention of keeping it from falling into their hands. The French captured Abomey and made Behanzin's brother, Agoli-Agbo, the new king under the French colonial government.

Under King Agoli-Agbo I's leadership, the royal palaces were restored around the beginning of this century. It is not clear how much of the palaces were destroyed in the fire and reconstructed early on, and there are many questions regarding the dates of origin of the surviving bas-reliefs. They may have been reproduced all or in part after French colonization. Early documents report that the royal compound at Abomey appeared as a vast camp of ruins. The Adjalala of King Glélé—or the Salle des Bijoux (Hall of the Jewels) as the palace is now known—is listed among the buildings still visible. This suggests that of the surviving bas-reliefs, those from the Salle des Bijoux are possibly from an original group. Whatever their age, they are the oldest of the bas-reliefs that remain.

In 1911 the French undertook their own effort to restore the palaces, particularly the compounds of Guézo

Left page: **Three bas-reliefs on the exterior walls of the Adjalala—or palace—of King Glélé before their removal in 1988.** ***Photo:*** **Courtesy the Benin Department of Cultural Heritage.**

Top: **The newly reconstructed Adjalala of King Glélé.** ***Photo:*** **Francesca Piqué.**

Right: **A column of bas-relief replicas as they appear on the newly reconstructed Adjalala.** ***Photo:*** **Susan Middleton.**

King Agoli-Agbo Dedjalagni of Abomey, surrounded by members of the royal entourage and the bas-relief conservation team. *Photo:* Susan Middleton.

and Glélé. Additional restorations took place between 1931 and 1933 and included the reconstruction of buildings and bas-reliefs and the replacement of traditional high-pitched, wide-eaved thatched roofs with low-pitched roofs of corrugated metal. These latter changes ultimately proved damaging to the palace bas-reliefs since, without the protection of the wide-eaved roofs, they suffered extensive erosion and decay.

Following heavy rains that damaged the palaces in April 1977, the government of Benin contacted UNESCO for advice on conserving and restoring both the museum collections and the damaged structures. In 1977 and 1978 UNESCO provided conservation assessment, restoration plans, conservation equipment, and recommendations for long-term measures to safeguard the museum. In the mid-1980s the Royal Palaces of Abomey were included as a cultural site in peril on the UNESCO World Heritage List.

In 1988, at the suggestion of a German architect working in Benin, the Salle des Bijoux bas-reliefs were detached from their facade prior to the building's reconstruction.

Because these were the last bas-reliefs thought to be originals, they were the only ones saved in the reconstruction of different palace buildings in the museum compound. After they were removed, the Salle des Bijoux bas-reliefs were remounted as individual panels in heavy casings of stabilized earth (local earth plus 8%–10% cement). Since their detachment, they have been moved several times between different storage areas in the museum.

Conserving the Bas-Reliefs

In 1991 a delegation from the GCI—including Director Miguel Angel Corzo, then–Special Projects Director Neville Agnew, Training Program Director Marta de la Torre, and Julián Zugazagoitia, a GCI consultant—visited several sites in West Africa to familiarize themselves with conservation needs in the region. During the delegation's visit to the Royal Palaces of Abomey, the Benin Ministry of Culture and Communications requested assistance in conserving the deteriorated bas-reliefs. Because of its interest in African cultural heritage and its expertise in conservation of earthen materials, the Institute agreed to collaborate with the Department of Cultural Heritage—part of the Ministry of Culture and Communications—on a project to document the bas-reliefs, study the causes of their deterioration, conserve them, and provide training to selected local staff.

"We wanted to maintain authentic elements on the site upon which we could build archives," explains Rachida de Souza, Director of the Department of Cultural Heritage. "With that idea in mind we knocked on many doors. The Getty Conservation Institute responded favorably to our appeal, encouraged us, and helped us undertake a unified program of research, documentation, training, and conservation." Once the bas-reliefs are conserved, she says, they will form an integral part of the museum's collections.

Of the 56 bas-reliefs originally on the walls of the Salle des Bijoux, 50 were located. Unfortunately, their detachment had fundamentally changed them. No longer an ensemble of architectural elements with a story to tell, the bas-reliefs were now separate artifacts—a fact that diminished their significance as a set of symbols recounting the feats of Glélé and his power as king.

For most of the panels, the depth and proportions of the niches had been modified by the cement casings, so that their original appearance had changed. Moreover, many of the bas-reliefs were severely damaged. One bas-relief had fallen and was in pieces face down in an outdoor storage area. Previous restorations and repairs were evident, and many areas exhibited differences in level, color, and surface texture. Additionally, several superimposed paint layers could be identified, at times revealing an entirely different polychromy in the different layers.

The collaborative project to conserve the bas-reliefs was officially launched in autumn 1993 with the first conservation campaign. Since then, work has been carried out during spring and fall field campaigns, supported by research, preparation, and study in between. During the campaigns the bas-reliefs—each weighing up to 300 kilograms, or over 650 pounds (about as heavy as a large refrigerator)—must be moved from their storage area into the atelier for treatment, then back into storage following conservation, to await their

ultimate public display. Local resources are being used for the manufacture of customized iron easels, storage for the bas-reliefs, and a system of transport, which includes a custom-designed pushcart, a dolly, and a pulley system for moving the artworks.

The conservation is limited to the stabilization of the bas-relief panels. Prior to transportation, the fragile paint layers of each bas-relief are temporarily protected with a facing of Japanese paper applied with water over the painted surface. Unsightly old repairs that show a difference in level, color, or texture are removed or leveled. Further conservation treatment includes the filling of cracks and voids. For this procedure, local earth matching that in the originals is used. Delaminated paint layers are reattached with a very dilute acrylic emulsion adhesive. Finally, with cotton swabs and water, the surfaces are cleaned of the drips and accumulation of red earth. Inpainting is limited to background areas, so that the traces of damage and of wear—evidence of the bas-reliefs' history and age—are left exposed.

One of the main objectives of the project is to train selected Department of Cultural Heritage staff members in the planning and practical aspects of the conservation program. Training covers project development and organization; documentation and technical examination; theory and practice of conservation; and storage, exhibition, and long-term maintenance of the bas-reliefs.

Mme de Souza believes that the knowledge gained through the project by her department's staff will have a long-term impact. "Some of the staff will remain on the site to assure continuing preventive conservation of the bas-reliefs. Others will return to their respective museums, but will be a continuing resource for the Abomey site. At the same time, they will also pass on and continue to use their acquired knowledge at other sites where there are similar problems of conservation and restoration."

Documentation is another significant aspect of the project. It includes historic research on the bas-reliefs to assist in understanding their evolution and the causes of their deterioration over time. The project team is also preparing written, graphic, and photographic documentation of the conservation itself. In addition, the GCI is producing a one-hour documentary for the general public on the conservation and cultural significance of the royal bas-reliefs.

The Future of the Bas-Reliefs

A long-term maintenance and monitoring program is now being designed and implemented for the conserved bas-reliefs, and an exhibit featuring them will ultimately be installed at the Musée Historique d'Abomey. Since their detachment from the Salle des Bijoux facade in 1988, the building has been reconstructed, and copies of the original bas-reliefs now adorn it. While it would have been appropriate to reinstall the bas-reliefs in their original positions on the facade of the Salle des Bijoux, it is perhaps preferable to exhibit them in an interior setting where they will be more protected.

Not only does the Salle des Bijoux house part of the museum's collection, it is also an integral part of a palace grounds and continues to serve as the site of royal rituals and events. Because of the site's ceremonial importance, the present king, Agoli-Agbo Dedjalagni, and the royal family are consulted on its conservation, management, and development. The king and his ministers have met several times with the team conserving the bas-reliefs, and the king himself has shown his interest in the project by making an official visit to the conservation atelier and the residence of the GCI team in Abomey. Afterward he stated that this visit was an expression of the royal family's appreciation for the work being done. The king's prime minister, Damien Agoli-Agbo, told the team that his visit to the conservation atelier had changed his conception of what preservation meant with regard to the bas-reliefs. He now recognized that rather than restoring the bas-reliefs to their original state, the project was preserving their *history*.

The bas-reliefs, both those being conserved and those still being made, reflect a culture that integrates living tradition with the objects and sites of its past. The conservation of the palace bas-reliefs is part of a larger effort to preserve this living culture, craft, history, and national identity.

The palace buildings, the museum's collection of objects, and the bas-reliefs are important not simply for the

The storage space at the Musée Historique d'Abomey where the bas-reliefs have been housed. *Photo:* Leslie Rainer.

Transporting a 300 kilogram bas-relief to the atelier for conservation treatment. *Photo:* Susan Middleton.

The badly damaged back of one of the bas-reliefs prior to treatment. *Photo:* Susan Middleton.

The same bas-relief, treated with Japanese paper and surrounded by cotton, during preliminary treatment. *Photo:* Susan Middleton.

The conservation team at work in the atelier.
Photo: **Susan Middleton.**

past they represent but also for the tradition they help maintain. Because of its continued ceremonial use, the Musée Historique d'Abomey is not solely a museum in the traditional sense.

"Our colleagues," says Mme de Souza, "tell us that this is not a museum, since the objects, though they are museum pieces in the sense that they are inventoried, continue to be used. The site also is functional." The ceremonies and rituals observed on the palace grounds are part of what she calls the nation's "nonmaterial" culture. "We believe that this site lives through the complementary existence of its material culture—its buildings, its objects, its bas-reliefs—and its nonmaterial culture, which is its most important dimension."

For the GCI as well, the Abomey project is more than the conservation of a set of unique objects. It is the preservation of culture—and, as Neville Agnew, the Institute's Associate Director for Programs, expresses it, "the cultivating of a growing consciousness in Benin regarding the importance of conservation."

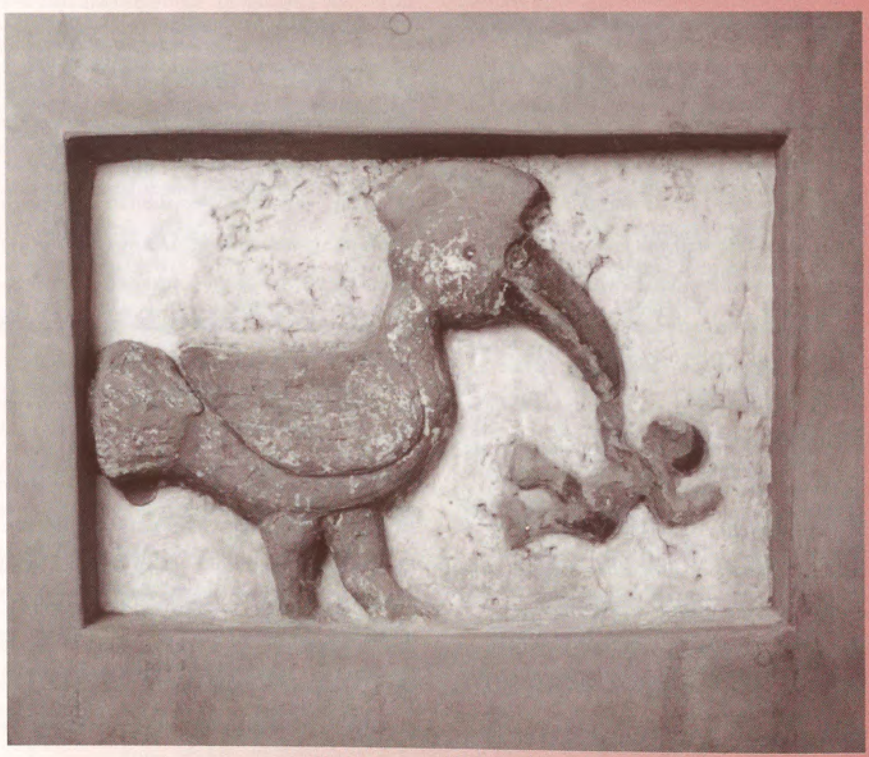
It is an appropriate image given the meaning of King Glélé's name—"cultivated field"—derived from the traditional saying "The cultivated field is difficult to move." For Glélé, the name was meant to convey the firm roots of his power. Perhaps in the future it will come to stand for the enduring quality of the culture he represented.

Francesca Piqué is a Special Projects Research Fellow at the GCI. Leslie Rainer is a Special Projects Senior Fellow. Together they lead the GCI's team on the Abomey project.

Principal Participants in the Abomey Project

Benin Government Officials: King Agoli-Agbo Dedjalagni, Damien Agoli-Agbo, Jean Akohouendo, Rachida Ayari de Souza, Marius Francisco, M. Toussaint Godonou, Félicienne Guinikoukou, Paulin J. Hountondji, Mathias Labintan, Pierre Metinhoué, Gabriel Orou Bagou, Denise Sossouhounto, and the staffs of the Historic Museum of Abomey and the Ministry of Culture and Communications. *Conservation:* Christophe Agbachi, Neville Agnew, Léonard Ahonon, Justin Alaro, Guillermo Aldana, Désiré Awoui, Pascal Ayoyito, Mitchell Bishop, Jules Bocco, Michèle Buchholz, Pedro Pablo Celedón, Martha Demas, Denis Dohou, Pia Dominguez, Valerie Dorge, Aimé Gonçalvez, Michel Hebrard, Benoît Houinato, Janvier Hounlonon, Gilbert Kinkin, Molly Lambert, John Lewis, Kathleen Louw, Susan Middleton, Dorothé Mizéhoun (Ayadokoun), Sabrina Motley, Constant Noanti, Francesca Piqué, Leslie Rainer, Stephen Rickerby, Dwayne Rude, Constant Samson, Sheri A. Saperstein, Marc Simon, Sophie Small, Edouard H. Tokotchi, Sara D. Tucker, Aurel Zeigler, Julián Zugazagoitia, and the staff of the Department of Cultural Heritage. *Scholars:* Alexis Adandé, Joseph Adandé, Giovanna Antongini, Nondichao Bachelou, Suzanne Preston Blier, Bellarmin Codo, Josette Rivallain, Claude Savary, Tito Spini, and Pierre Verger. *Project Support:* Charles Aguida, Michel Alladaye, Nestor Gnankadja, Lambert Hounsa, and Cyprien Tokoudagba and family.

A royal bas-relief after conservation treatment.
It depicts a hornbill, one of King Glélé's symbols of power. ***Photo:*** **Susan Middleton.**



Living Traditions

A Conversation with

Rachida de Souza

Rachida Ayari de Souza is the Director of Benin's Department of Cultural Heritage. Educated in sociology, she received further training in museology from the Ecole du Louvre and has completed numerous fellowships in French and U.S. museums. Since 1982 she has worked on the organization and promotion of the Beninois museums and contributed to the planning of several exhibits and catalogues. She spoke with Leslie Rainer and Francesca Piqué, who are leading the GCI's team that is conserving bas-reliefs from the collections of the Musée Historique at the Royal Palaces of Abomey.

■ *Interviewer: Could you talk about the view of cultural heritage conservation in Benin, in comparison with the tradition of conservation in Europe and the Americas?*

■ Rachida de Souza: Our view of cultural conservation is not simply material. To be sure, we carry out projects devoted to buildings and objects, within the limits of our resources. But there is an important second dimension—to preserve and maintain the cultural totality which includes dance, music, and ritual. All this is the foundation of our cultural heritage and nourishes it. This kind of preservation can confuse people. Though it is highly codified in its presentations, it is not archived in a written sense. It leaves no material trace. Nevertheless, we try to hold on to it because it ensures the functioning of certain cultural sites in Benin. We try, as much as possible, to link the conservation of material culture and the cultural life thriving in the heart of the communities.

This is a much greater task for us than for our European and U.S. colleagues who conserve inventoried and codified objects or cultural sites which are commonly what I would call neutral sites. There, conservators restore things by the established criteria of conservation and museum techniques. But here in Benin the museum object is not completely under our control. It is the object of our conservation efforts, but it also continues to be the property of the community. The ethical standards of museums will tell you that only the conservator should handle it. Here, however, the object is also regularly handled by one or another person of the community charged with sacralizing or desacralizing it after it is used. Hence there is multiple handling of the object, which raises complex problems of conservation, use, and preservation. If one sets the object off limits, it loses its function and dies. If it continues to have a function, then we are obliged to respect that function and the conditions it imposes upon us.

The GCI is collaborating with the Department of Cultural Heritage at the site of the Royal Palaces of Abomey—specifically on the conservation of bas-reliefs that were once part of King Glélé's official palace. Could you talk about the origins of the project?

The palaces constitute one of the most important cultural heritage sites of Benin. They have been, for a long time, a concern of the government and various official agencies charged with preserving our cultural heritage. The goal has been to gather funds to finance specific conservation projects, especially those devoted to preserving the bas-reliefs which constitute truly original elements of this site.

We knew that certain bas-reliefs were seriously threatened, and we wanted to take the first, highly urgent, preventive steps by dismounting and sheltering them. But this was not a completely ideal solution; the deterioration of these elements continued. It was at this point that we knocked on

John G. Lewis

the door of the Getty Conservation Institute, which responded favorably to our request.

How would you describe the cultural significance of the reliefs?

The bas-relief, as a kind of pictogram, bears a message that narrates, in certain ways, historical events. It is also the bearer of particular cultural values. The bas-relief, in glorifying important royal victories or in presenting royal emblems, communicated, beyond linguistic differences, a visual message of power and prestige which the kings in Abomey wanted to implant in their own kingdom, among those they battled, with those whom they traded, or with those under their control.

What do you envision as the future of the bas-reliefs, once their conservation is complete?

Since there is an ongoing project to reorganize the collections and exhibitions at Abomey, we think the bas-reliefs will play a very important role in our exhibitions. We also hope that they will play a role as an archive for research. They constitute important historical records.

How would you try to attract interest in the palaces through these bas-reliefs? Is there a special plan that you see being implemented?

Currently our activities are limited to the palaces of the kings Guézo and Glélé, which cover almost five acres and house the Musée Historique d'Abomey. However, the royal palace site, as included on the UNESCO list of World Heritage Sites, covers nearly 109 acres and has potential we wish to develop. We should like, for example, to design a visitor itinerary throughout the site. This would provide a better understanding of the culture of the Fon kingdom. The idea is not only to restore the physical site but also to enhance understanding of it. This means mobilizing financial support, furthering research, and using new techniques.

So what the GCI is doing in collaboration with the Department of Cultural Heritage is just the tip of the iceberg?

Yes. We are now working on a policy of coordinated projects at the site. Presently we have ICCROM helping us with our collections. CRATerre-EAG is giving us technical support to develop and implement a maintenance plan. With the GCI project, we have undertaken together a very important historic task. For the first time we have acted upon architectural elements, giving them the attention they deserve. But we wish to go further, raising awareness of the museum and developing and promoting the entire site. The GCI gave us the starting signal to begin a project that could be developed over the coming years. We have only just begun the journey and would like to continue together in developing the site.

What part is the royal family playing in the site's development?

We consult with them regularly. There is an official entity called the Council of the Royal Families of Abomey. His Majesty, Agoli-Agbo, is the president of this council and its principal spokesman when it comes to certain decisions about the palace. We consider the royal families to be the

traditional stewards of these locations. It is they who carry out the daily rituals and ceremonies at the palace. In one sense, we think of them as the first conservators of this heritage. We are the institutional conservators, the technicians who bring to bear our ethical concerns, but in terms of vision and philosophy of conservation and preservation of the site, the families play a very important role. The palace is, for them, a place of constant daily activity.

Why should we preserve our cultural heritage? Why is it important to know the past?

There's a famous proverb that says, "If you do not know where you are going, you should know at least where you come from." I think it is important to equip oneself with the values of one's culture and to share one's heritage with others. It's also important for future generations. At the museum we are trying to work with young people, introducing them to things that they do not always find at school. Knowledge isn't only acquired at school. There is also an orally transmitted knowledge which in our day is somewhat pushed aside by academic or "scientific" learning. We do not want to leave out that other dimension of knowledge and of cultural values found in art, such as the iconography of the bas-reliefs.

What sort of educational programs does the museum have for young people?

We have not fully established a policy to reach out to the schools. It is not that we do not have organized visits from the schools—we certainly do. But our program is neither systematically organized nor sufficiently focused. We do, however, consider this very important, because the museum presents knowledge through aesthetic and oral tradition that complements schoolbook knowledge. Moreover, the museum offers a concrete manifestation of historical events through one or another object that allows students to understand better such things as the history of the Kingdom of Dahomey.

The educational potential in Abomey is extensive. For us the bas-reliefs are an iconographic source essential for an understanding of the environment, but also for an appreciation of the arts, history, and anthropology. We are going to work more on our cultural program with the schools and try to get young people to come to the museum. But we must also think of how better to bring the museum to the schools.

What about the connection of this heritage to those beyond the borders of Benin? What meaning might the royal bas-reliefs of Abomey have to an American of African ancestry?

There is perhaps the recognition—what I would call the rediscovery—of a history which is not simply an articulated series of events as recorded academically in books but a history that continues to be lived out. In my opinion, this is what could strike an American. To put it another way, it is possible to feel this living connection and this constant reinterpretation of history that the individual draws from oral traditions—which is perhaps not felt in Europe or the Americas, where history is more commonly taught and accepted as simply the past. This questioning and reinterpretation of history is not simply part of oral tradition but owes much to our way of being and functioning within this culture.

What is the role of tourism in the national economy, in relation to the cultural heritage?

Cultural tourism in the national economy is not as developed as we would like, but it does exist. Many tourists who arrive from Togo tour Benin and visit various museums and monuments. The problem is that coordination with tourism is still very informal. We do not have a development plan because we do not have the funds to enhance the site. Tourism has not yet yielded money for restoration, development, or promotion of this kind of site.

We do approach tourism with a good deal of caution because there is a danger, over the long run, of fostering a kind of commercialism that could eventually disturb certain traditions. These sites are not simply material places and buildings but places of living tradition. We should not like to wind up with what I would call "ceremonies on demand." That kind of commissioned ceremony would risk destroying authenticity and the value of all such cultural expression.

Nevertheless, one could develop troupes of young people who revive traditional dances. There is also a group of young women who perform royal dances. We think that such groups could help make the museum in Abomey a cultural center that would attract a public with living cultural forms. All this requires help. We should like to create, as we have done in [the city of] Ouidah, an association of friends of the museum. Such an association could concentrate its efforts on stimulating such programs.

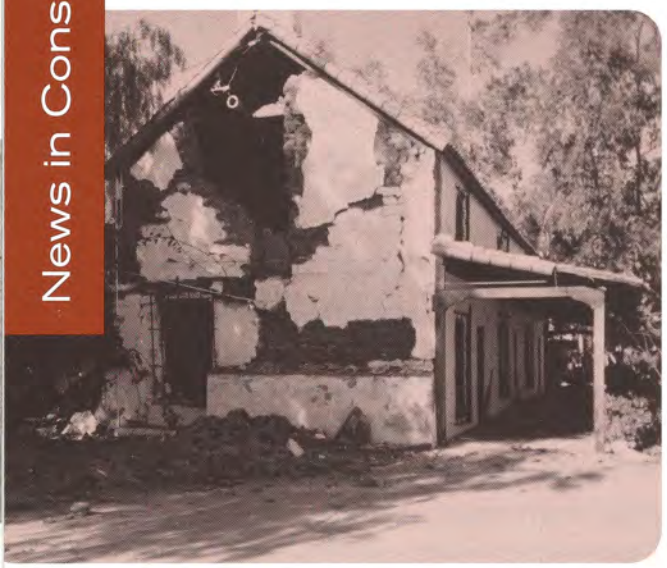
How much public support for conservation is there in Benin?

We have support within the immediately surrounding communities, to whom the cultural heritage belongs. At Abomey, for instance, within the community, we have a very high degree of awareness of the heritage. These communities carry on discussions with us; they participate in making decisions with us. Among the wider, national public, the notion of conservation is not clearly understood. Here we have the task of getting people to understand the idea of a national—not simply a local—heritage. That legacy belongs first to the community, but for palaces like those of Abomey, it is also national and international. Since the site is on the World Heritage List, it is the property of humanity.

WHEN THE EARTH MOVES

THE GETTY SEISMIC ADOBE PROJECT

The Andres Pico Adobe (originally constructed in the mid-19th century) after the 1994 Northridge earthquake. *Photo:* E. Leroy Tolles.



By William S. Ginell

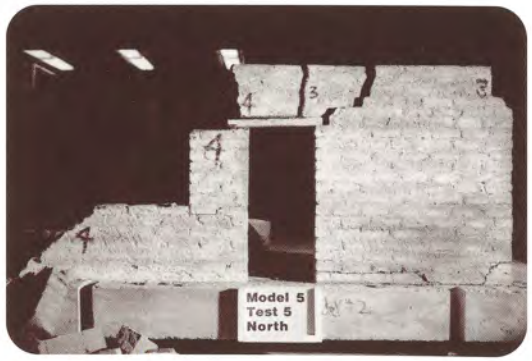
Adobe buildings—the vernacular earthen architecture of the Spanish colonial past in the Americas—are a vanishing feature of the western United States. In California, for example, fewer than 5 percent of the estimated 900 adobes originally constructed in the San Francisco Bay area still survive. Statewide, only about 350 historic adobes are left.

Many of the buildings now gone were destroyed by earthquakes, and those still standing remain highly vulnerable to future quakes. But because current methods of strengthening adobes are both invasive and expensive, most building owners have been reluctant to undertake retrofitting measures. Using materials such as steel and concrete, these methods often produce results that are too intrusive and are physically and aesthetically incompatible with adobe. In addition, they frequently involve architectural alterations inconsistent with preserving the historic fabric of the buildings, ignoring the fact that every part of an adobe—down to the individual, handmade bricks of dried mud—is an artifact whose modification or loss diminishes the historic record that the building represents.

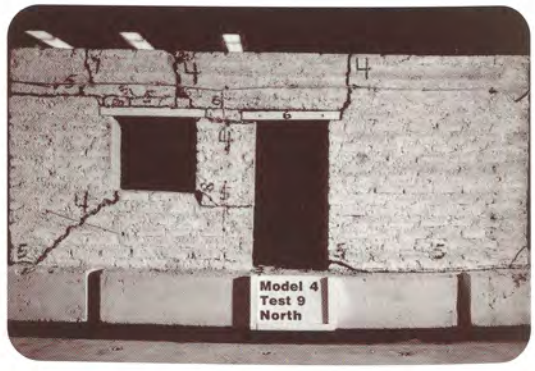
In 1990 the Getty Conservation Institute initiated the Getty Seismic Adobe Project (GSAP) to investigate alternatives to existing methods of retrofitting. Six years later, after studying dozens of historic adobe buildings, analyzing recent earthquake damage to adobes, and developing and evaluating new retrofitting techniques through numerous tests, the project's team has come up with ways to provide seismic protection at a reasonable cost while substantially preserving the authenticity of historic adobes. A departure from current retrofitting practice, the methods developed by the project are, for the most part, simple and inexpensive enough to be implemented by unskilled labor in areas with limited resources. They can therefore also be used in the many communities around the world that still rely on earth as a basic building material.

At the project's beginning, a number of historic California adobes were studied so that their structural conditions could be correlated with their architectural features and any prior retrofits. The study suggested (as might be expected) that tall, thin-walled adobe buildings are very susceptible to collapse once the walls crack. In contrast, many unretrofitted buildings with thick walls and a low wall height/thickness ratio had survived earthquakes, even though the walls were cracked. Cracking in these structures results in the formation of large segments of wall that rub against each other during quakes and dissipate energy by friction. Only when the relative displacement of the blocks becomes very large do walls fall and roofs collapse.

The challenge for the GSAP team was not how to prevent cracking—an inevitable consequence of an earth-



A one-fifth-size scale adobe model, unretrofitted, after being subjected to a series of simulated earthquakes.



A retrofitted model still standing after undergoing simulated earthquakes of substantially greater intensity. *Photos:* Louise Walker.

Left: **The one-half-size scale model of a *tapanco*-style adobe with no retrofitting after the collapse of a gable end wall during testing on the shaking table in Skopje.** ***Right:*** **The gable end wall at the moment of collapse (the thin cables visible on the wall were part of the testing's instrumentation and not retrofitting).**

The gable end wall of a retrofitted tapanco adobe model after a test of equal intensity. ***Photos:*** **William S. Ginell.**

quake—but, rather, how to minimize the movement of those large wall segments during a quake. For that reason, the team proposed retrofitting methods aimed at achieving stability rather than at increasing strength. The principal techniques investigated included the installation of nylon straps that encircle the walls horizontally, vertically, or both. These straps absorb energy and can be easily hidden beneath a coat of plaster. A second method involved the use of center cores—thin, flexible steel rods placed in holes drilled vertically into the wall and grouted in place.

Both methods were designed to restrain the movement of adobe blocks and prevent walls from overturning. They were tested on one-fifth-size model buildings that were subjected to simulated earthquakes on a computer-controlled shaking table at the Stanford University Blume Earthquake Engineering Test Center. The tests studied the effects of various combinations of retrofitting techniques on both the in-plane and out-of-plane behavior of walls and the impact of varying wall height/thickness ratios. The model buildings consisted of four walls, 1.5 meters long and 0.6 meters high (5 by 2 feet). Each model had door and window openings. Also tested were models based on a *tapanco*-style building, a typical southwestern American design that includes floor and roof systems and highly vulnerable gable end walls. Two of the three tapanco models were retrofitted with different combinations of straps and center core rods.

The results of the roofless model tests demonstrated that stability-based retrofits do indeed increase a model's seismic resistance to collapse, preventing walls from overturning and minimizing permanent displacements. The retrofitted tapanco models also displayed dramatic improvement in stability over the one unmodified model. Especially significant were the stability and damage control afforded by the thin center core rods.

One factor that could not be assessed in the small models was the effect of gravity on the behavior of more massive adobe walls. To address this, two tests were conducted on a large shaking table in Skopje, capital of the Former Yugoslav Republic of Macedonia, where the GCI is doing seismic retrofitting research on Byzantine churches (see *Conservation,* vol. IX, no. III). Retrofitted and unretrofitted tapanco models, identical in design to those tested earlier but larger (being one-half size), were built with walls 3.6 meters long and 3 meters high at the gable end walls (12 by 10 feet, excluding the roof). Both models were instrumented to provide quantitative information. In these tests, the gable end wall of the unretrofitted building collapsed at about the same level of shaking intensity as the smaller scale models. The crack patterns, too, were very similar. In the retrofitted building, the straps and especially the center cores proved very effective in preventing collapse. Since an increase in the size of the scale models did not change the test results, gravity does not appear to be a significant factor.

The January 1994 Northridge earthquake provided affirmation of the approach taken by GSAP. In the months following the quake, the GSAP team surveyed 19 historic adobes in the Los Angeles area, documenting 8 in detail. It was found that many of the adobes suffered damage similar to that seen in the tests of unretrofitted models. This finding supports GSAP's experimental methods and results, offering additional evidence that the project's retrofitting techniques would prove effective in an earthquake. (For further information on the recently published earthquake survey, see page 22.)

The inexpensive and minimally invasive techniques tested in the project have application beyond the preservation of historic California adobes. In seismically active areas of the world, such as Latin America and China, where earthen architecture is widely used, the groundbreaking work of GSAP can also be employed to increase the stability of buildings and limit loss of life. The project's final annual report and a summary report entitled *Guidelines for Seismic Stabilization of Historic Adobe Structures* (both to be published later this year) will encourage the use of the methods developed to retrofit and protect not only the western United States' historic architectural heritage but vernacular earthen architecture around the world.

William S. Ginell is Head of Monuments and Sites in the GCI's Scientific Program; he coordinates the work of GSAP for the Institute.

In the Aftermath of Civil War

Cultural Heritage in Lebanon

By Selma Al-Radi

Since Lebanon's civil war ended in 1990, the country has been trying to reconstitute its institutions, destroyed during 16 years of savage fighting. In the last four years, enormous progress has been made toward rebuilding the nation's infrastructure and institutions. But much remains to be done, including protecting and conserving Lebanon's cultural heritage, which suffered neglect and destruction during the brutal war.

The first action of the post–civil war government was to create an independent agency, Solidere, that would be responsible for the reconstruction and development of Beirut's central district. Beirut was where the war began, and the city's center was repeatedly and heavily bombarded, reducing many 19th-century buildings to rubble-strewn shells. Under Solidere's reconstruction plan, a few historic buildings were designated for restoration, but the rest of downtown was virtually razed in preparation for new construction.

While this clearing of the city's center constituted a loss of some of the city's architectural heritage, it did provide an opportunity for archaeologists to determine the chronology of the ancient city known as Berytus. Under the auspices of the Directorate-General of Antiquities—the agency responsible for Lebanon's cultural heritage—and with some financial support from Solidere, an international campaign of rescue excavations downtown was initiated in 1993.

Top: **The Roman ruins at Tyre with modern buildings in the background. Many illegally constructed buildings went up during the war and now intrude on the site.**

Bottom left: **War-ravaged buildings in the center of Beirut.** ***Bottom right:*** **A 1994 archaeological excavation in downtown Beirut, one of a series of excavations that have uncovered remains dating back to the middle Bronze Age.** ***Photos:*** **Selma Al-Radi.**

Two views of the temple of Jupiter at the Roman site of Baalbek. Lebanon's civil war halted a restoration program then under way at the site. *Photos:* Selma Al-Radi.

Remains of the middle Bronze Age and Phoenician city walls of Beirut were unearthed, as were houses, workshops, baths, and shops dating from the Hellenistic, Roman, Byzantine, and Mameluke periods. Parts of a monumental 3rd-century Roman forum were discovered by bulldozers excavating foundations for a government office building. Mosaic floors, ceramics, terracotta and stone sculptures, glass and bronze vessels, lamps, and coins found during the excavations attest to the city's wealth through the ages. Some of these finds will be incorporated into the planned public spaces of downtown Beirut, while others will be displayed in the refurbished National Museum.

During the civil war, movement within the country was extremely difficult, and the Directorate-General of Antiquities was unable to carry out even its most basic duties. The country's many archaeological sites were left unattended, and the survival of historic cities depended largely on the conservation interests of local political forces. Tripoli and Sidon suffered relatively minor damage to their Crusader and Islamic monuments (they are presently undergoing basic restoration), and the Shouf area, east of Sidon, emerged virtually unscathed. Byblos, the ancient port city important during the third and second millennia B.C.E., also survived unharmed. Its Crusader/Muslim castle remains intact, although bullets and mortar shells have left their impact on the walls. However, archaeological excavations at Byblos urgently need a site management program. Protective railings are broken, burial pits are unprotected, and walking around can be a hazardous experience. The most famous archaeological site in Lebanon, the Roman site of Baalbek, with its imposing ruins of the temples of Jupiter, Bacchus, and Venus, was undergoing major restoration when the war began. Cranes and lifts were left in situ and are still bearing their loads of suspended stone blocks. The limestone facades have suffered from weathering and neglect, and this site, too, requires a conservation and maintenance program.

The Phoenician and Roman port of Tyre was seriously affected by the civil war. Its spectacular panorama—sweeping views of ruins set against the backdrop of the Mediterranean Sea—has been sullied by jerry-built constructions illegally thrown up during the war. Ten- and twelve-story buildings of cement and cinder blocks abut the walls of the Roman hippodrome and necropolis, intruding into the boundaries of ancient Tyre. Presumably, inhabitants of these buildings were also responsible for pillaging and vandalizing some of the sarcophagi in the necropolis. Many other sites around the old town were looted, including a unique Phoenician infant cemetery. Frequent Israeli air raids and the 1983 invasion have also left their mark on both Tyre and Sidon.

The headquarters of the Directorate-General of Antiquities at the National Museum was situated in the heart of a battle zone, the building literally standing on the infamous Green Line that divided East from West Beirut. The museum paid dearly for its location—bullets riddled its walls, and

rocket blasts pockmarked its facades. The interior was burned by direct rocket hits.

The catalogues, card indexes, and photographic archives of the National Museum were burned during the bombings; this damage makes difficult the present task of estimating the collection's original size and what remains of it. The former director, Emir Maurice Chehab, stowed smaller objects in the basement and sealed them behind double cement walls; he then spread the rumor, which many still believe, that the museum's objects had been sent abroad. The basement remains sealed; it will be opened only when the building has been secured and when there are enough conservators to undertake the daunting task of conserving the thousands of objects that will emerge.

The museum's sarcophagi and mosaics also survived because of the foresight of Emir Maurice. During a lull in the war, he had the sarcophagi encased in reinforced cement and the floor mosaics covered first with plastic sheeting and then with a layer of cement. The mosaics exhibited on the walls are still in place, although one has been pierced by a large rocket hole. Unfortunately, objects hurriedly packed into the library on the second floor did not fare well. Two rockets hit the library, and the ensuing fires burned the 2,000 or so bronzes and other objects within, mangling some and charring others. The conservator has been kept busy trying to stabilize and consolidate these objects.

The roof and the administrative wings of the National Museum were repaired in 1993. During 1995 work on the museum's front facades was completed; the rear facades, badly damaged by rocket fires, are presently being restored. Replacement of the staff has proved more complicated than building repair. From a prewar number of 150, the Directorate-General of Antiquities is down to only 18. There are only two archaeologists (aided by two volunteers), and the Director, Dr. Camille Asmar, is an architect-restorer by profession. There are no curators, architects, draftspersons, or photographers; there is a library without a librarian and a conservator with a laboratory—but almost nothing else.

Despite the lack of personnel and the large amount of conservation work that needs to be done, there is enormous pressure from the government and the public to reopen the museum. In response Dr. Asmar has taken the cement casings off the sarcophagi and plans to open the building temporarily so that the public can see the museum's condition, then close it again to complete the interior's restoration—a good compromise.

Top: **The battle-scarred facade of the National Museum in Beirut as it appeared in 1994. The facade was repaired the following year.** ***Bottom:*** **A box of antiquities in the museum's storeroom.** ***Photos:*** **Selma Al-Radi.**

Even though the Directorate-General of Antiquities remains underbudgeted, understaffed, and overworked, it has made progress in readying the museum for opening up the storeroom and dealing with the collection. The director of the museum has made a plan for permanently reopening the building after the conservation of the objects has been completed. But additional trained personnel—particularly conservators with expertise in metal and stone—are needed to accomplish that task. The establishment of a management program for the major archaeological sites is another priority. It is important that this program be operational before mass tourism starts again in Lebanon.

The country, emerging from years of civil strife, is rebuilding itself on all fronts, and its rich cultural heritage can play a significant part in reconstruction. If properly managed, this heritage can help provide tourist revenues for the restoration and preservation of the nation's monuments and museums and contribute considerably to reestablishing Lebanon's national identity.

Selma Al-Radi is an archaeologist and a member of the GCI's Visiting Committee.

Upcoming Courses

Pest Management and Control in Museums

October 18–25, 1996

West Dean College, West Sussex, U.K.

The Getty Conservation Institute, in partnership with the Conservation Unit of the United Kingdom's Museums and Galleries Commission, will offer a course on pest management and control at West Dean College in West Sussex, United Kingdom. The course is designed for conservators, collection managers, and other museum personnel responsible for overseeing pest management policies and activities, including eradication procedures, within their institutions.

Course topics will include: integrated pest management as part of an overall preventive conservation strategy; identification of insect pests and the damage they may cause; methods to prevent infestations; and nontoxic options for combating infestations. Particular attention will be given to the use of reduced-oxygen environments, through lectures and practical exercises. Instructors for the course will be leading specialists in the areas of insect identification, integrated pest management, and insect pest eradication methods.

For further information, please contact Valerie Dorge of the GCI Training Program at 4503 Glencoe Avenue, Marina del Rey, CA 90292, U.S.A. Telephone: 310 822-2299 / Fax: 310 821-9409.

Pan-American Course on the Conservation and Management of Earthen Architectural and Archaeological Heritage

November 10–December 13, 1996

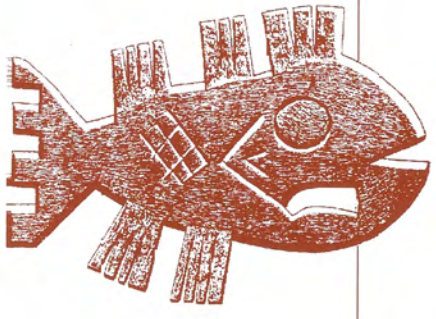
Chan Chan, Trujillo, Peru

This is an intensive, five-week course of specialized professional training in situ at the Archaeological Zone of Chan Chan, the city of Trujillo, and other historic sites in the Moche and Chicama Valleys in the region of La Libertad, Peru.

The course program promotes a multidisciplinary methodology for the conservation and management of earthen architectural and archaeological heritage. Course topics will be developed through lectures, demonstrations, practical laboratory and field exercises, case studies, site visits, discussions, and other activities. Particular attention will be devoted to the state of knowledge in the field of earthen architectural heritage; the problems of decorative surfaces, wall paintings, and polychrome reliefs on earthen supports; seismic mitigation; preventive conservation; and the development of conservation and management plans for such patrimony. The course will be conducted in Spanish.

The course is a component of the Programa Integral para la Conservación del Patrimonio Monumental de Tierra, initiated by the Instituto Nacional de Cultura del Perú—Dirección Regional La Libertad (INC-DRLL). Through the Programa Integral, the INC-DRLL promotes training, research, documentation, cooperation, and public awareness regarding the study, the conservation, and the management of earthen heritage. INC-DRLL is organizing this course in collaboration with the International Centre for Earth Construction—School of Architecture of Grenoble (CRATerre-EAG), the International Centre for the Study of the Preservation and the Restoration of Cultural Property (ICCROM), and the Getty Conservation Institute, with the support of the World Heritage Fund of UNESCO.

While the deadline for enrollment in the course has passed, those desiring additional information regarding programs in this area of conservation should contact the GCI Training Program at 4503 Glencoe Avenue, Marina del Rey, CA 90292, U.S.A. Telephone: 310 822-2299 / Fax: 310 821-9409.



Recent Courses

Preventive Conservation: Museum Collections and Their Environment

In November 1995 the Getty Conservation Institute, in cooperation with Mexico's Instituto Nacional de Antropología e Historia (INAH), offered its first preventive conservation course in Latin America. The course was held in Oaxaca, Mexico, for conservators and conservation scientists working in Latin American museums. The governor of the state of Oaxaca, Lic. Diodoro Carrasco Altamirano, addressed the course's 25 participants at the opening session. Nine countries were represented: Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Peru, and Venezuela.

The course focused on the technical and organizational factors that affect implementation of preventive conservation, combining technical information on the museum environment with a review of strategies for working with museum colleagues and other specialists to integrate preventive conservation into museum policies and operations. Course instructors included experts from Brazil, Colombia, Venezuela, and the United States.

K. Klein

Upcoming Events

Conservation In Situ of Mosaics

The Sixth Conference of the International Committee for the Conservation of Mosaics (ICCM) is a forthcoming forum in which conservators, restorers, conservation scientists, archaeologists, curators, and historians can consider the philosophy, science, and methods of conserving mosaics in situ. The conference will be held in Nicosia, Cyprus, from October 24 to October 28, 1996. An aim of the conference is to encourage an exchange of experiences and viewpoints on the practical aspects of mosaic conservation in situ in the hope that this exchange will lead to a better appreciation of the methods available.

The Getty Conservation Institute, through its Training Program, is coorganizing the conference. Other participating and sponsoring organizations include the ICCM and its board of directors, the University of Cyprus, the Bank of Cyprus Cultural Foundation, and ICCROM.

For further information on the conference, please contact Prof. Demetrios Michaelides, Archaeological Research Unit, University of Cyprus, Kallipoleos 75, Nicosia, Cyprus; or Lori Anglin, GCI Training Program, 4503 Glencoe Avenue, Marina del Rey, CA 90292, U.S.A. Telephone: 310 822-2299 / Fax: 310 821-9409.

Recent Events

Preservation Center Opening in St. Petersburg

Санкт-Петербургский Международный Центр сохранения культурного наследия

The St. Petersburg International Center for Preservation officially opened on June 28, 1995. The center—founded jointly by the Getty Conservation Institute, the Russian Academy of Sciences, and the city of St. Petersburg—will provide opportunities for collaborative research and for information exchange about the latest findings in conservation, as part of an effort to help preserve the cultural heritage of St. Petersburg and its neighboring cities.

Tipper Gore, wife of U.S. Vice President Al Gore, was the honored guest at the center's opening ceremony. Also present were Zhores Alferov, Vice President of the Russian Academy of Sciences; Vladimir Yakovlev, Deputy Mayor of St. Petersburg; Miguel Angel Corzo, Director of the GCI; Esther Coopersmith, Chair of the St. Petersburg International Center for Preservation; Vladimir Lapin, Director of the Russian State Archives; and Jane Slate Siena, Head of Institutional Relations for the GCI.

The center is incorporated in the United States and registered in Russia as a nonprofit charitable organization. As a founding partner of the center, the GCI is working with professionals in Russia to develop critical pilot programs in preventive conservation and is also leveraging its own contribution by attracting resources from other foundations and corporations.

Conservation needs throughout Russia and the Commonwealth of Independent States are diverse and require new approaches to collections and building management. These include strategies that seek to prevent further deterioration of objects and that stabilize and protect entire collections and groups of historic buildings. Research and training are also needed in environmental standards and monitoring, exhibition installation, facilities development, collections management, emergency preparedness, and the safe handling and storage of artworks, archives, and library materials.

The center's programs began in March 1996 with Security Seminar 1, designed to address the urgent problems of safety and protection of collections. Seminar leaders were Wilbur Faulk, Director of Security, the J. Paul Getty Trust; J. Andrew Wilson, Assistant Director of Fire Protection, the Smithsonian Institution; and Oleg Boev, Chief of Security, the Hermitage State Museum. Programs are also under way in environmental research, cultural heritage tourism, and preventive conservation, in collaboration with Russian and foreign partners, including the government of the Netherlands.

Seismic Retrofit of Historic Adobes

A workshop, "Seismic Retrofit of Historic Adobe Buildings," was held at the J. Paul Getty Museum on March 10, 1995. The workshop was a collaborative effort of the GCI, the National Park Service, the National Trust for Historic Preservation, the California Office of Historic Preservation, the Los Angeles Conservancy, and the California Preservation Foundation.

The 10 invited speakers discussed topics that included: a survey of damage to adobe buildings following the 1994 Northridge earthquake; how preexisting conditions adversely affect the seismic performance of adobes; descriptions of recent seismic retrofits of historic buildings; and the results of experimental research at the GCI on new approaches to seismic retrofitting of historic adobes (the Getty Seismic Adobe Project). Following the presentations and lunch, the audience of about 150 engineers, architects, conservators, contractors, property owners, and government officials participated, along with the speakers, in extended roundtable discussions that ranged from adobe building conservation philosophy to details of traditional retrofitting techniques and of the new, stability-based concepts.

The proceedings of the workshop are available on request from either E. Leroy Tolles, Earthen Building Technologies, 2245 E. Colorado Blvd., Pasadena, CA 91107, or from William S. Ginell, Scientific Program, the Getty Conservation Institute, 4503 Glencoe Ave., Marina del Rey, CA 90292. Telephone: 310 822-2299 / Fax: 310 821-9409.

Nefertari Exhibition in Turin

The highly successful exhibition *Nefertari: Light of Egypt,* organized by the GCI and the Fondazione Memmo, was on display at the Promotrice delle Belle Arti, one of Turin's premier exhibition spaces, from December 15, 1995, to April 8, 1996. During its first two weeks alone, over 20,000 visitors attended. The exhibit originally opened in October 1994 at the Palazzo Ruspoli in Rome, where it was seen by nearly half a million visitors over the course of eight months. ►

Intended to raise public awareness of conservation's importance, the exhibit—using a variety of media—integrated history and the display of objects with a presentation of the conservation process. Centered on the theme of discovery, it commemorated the unearthing of the 3,200-year-old tomb of Queen Nefertari in the Valley of the Queens by Italian archaeologist Ernesto Schiaparelli in 1904, as well as the conservation of the tomb's wall paintings by the GCI and the Egyptian Antiquities Organization during the period from 1986 to 1992.

The large exhibition—which filled 1,500 square meters of gallery space—combined elements from the ancient to the futuristic to describe the tomb's meaning, history, art, archaeology, and conservation, and included more than 130 objects, some from Nefertari's original funerary furnishings. The Louvre, the British Museum, the Egyptian Museum of Turin, the Archaeological Museum of Florence, and Turin's Royal Library all loaned items to the exhibit. An interactive virtual reality gallery allowed visitors to walk through the tomb as it appears today as well as at the time of its discovery in 1904; to learn the meaning of its images and inscriptions; and to gain awareness of deterioration problems and treatment methods.

Scientific Update

Pollutants in the Museum Environment

The GCI Scientific Program has been measuring indoor-generated pollutants in museum environments—specifically gaseous organic carbonyl pollutants (formaldehyde, acetaldehyde, formic acid, and acetic acid)—since the late 1980s. Institute staff have occasionally had the opportunity to revisit an institution and observe changes implemented as a result of the GCI's pollution monitoring. One such institution is the Santa Barbara Museum of Art in Santa Barbara, California.

In 1988 the Santa Barbara Museum participated in the GCI's first survey of carbonyl pollutants in U.S. museums. The museum staff noticed that the internal lock mechanisms of wooden storage cabinets were corroding and brought this to the attention of the Institute's Cecily Grzywacz and Dusan Stulik. Air samples taken from the cabinets confirmed that the corrosion was due to the high levels of formic acid and acetic acid released from the wood products. When the collections were surveyed, carbonyl pollutant efflorescence was detected on a few objects, a finding that further indicated a pollutant problem in the storage cabinets.

In response to the survey findings, the museum modified the storage cabinet doors. The center portions of the doors were cut out and replaced with screens to increase air circulation. Subsequent testing by Cecily Grzywacz confirmed that these modifications had been successful. Formic acid was no longer detectable, and the acetic acid concentrations were reduced by 75 percent. This example demonstrates the impact of the carbonyl pollution surveys and the initiative of the Santa Barbara Museum, the usefulness of air sampling, and the importance of testing to confirm the effectiveness of palliative measures.

In 1993 the Institute's second major carbonyl pollutant survey was conducted at six museums in Glasgow, Edinburgh, and London, and at the Rijksmuseum in Amsterdam. Several display case designs were evaluated at the Rijksmuseum. This monitoring effort indicated pollutant problems within some cases. Institute scientific staff returned to the Rijksmuseum in 1994 for a very successful collaboration in which they monitored the levels of carbonyl pollutants in a series of newly designed display cases. Monitoring results confirmed that the new designs by the Rijksmuseum staff improved air quality with respect to indoor-generated carbonyl pollutants.

New Research

Brancusi's *Infinite Column*

The GCI's Scientific Program is collaborating with the Swedish Corrosion Institute in Stockholm to address some of the issues relating to corrosion of copper alloy surface coatings such as brass on metallic substrates. As part of the research, the GCI has established a testing station within the J. Paul Getty Museum grounds in Malibu, where metallic coupons, of internationally approved dimensions, are exposed to the ambient environment.

The research project was instigated in an effort to evaluate metallic substrates and organic coatings that could be used in the restoration and conservation of the Constantin Brancusi sculpture *The Infinite Column*. The sculpture, erected in the 1930s in Târgu-Jiu, Romania, is one of the most famous examples of Brancusi's work and forms part of a unique assemblage of outdoor sculptures in Târgu-Jiu that includes *The Table of Silence* and *The Gate of Kisses*. The results of the collaborative research will enable the GCI to provide advice to the Romanian authorities who are planning to dismantle the sculpture for inspection and conservation.

Brancusi coated the sculpture with a thermally sprayed brass finish that corroded badly, and the sculpture now suffers from deterioration of this coating, corrosion of the underlying cast iron panels, deteriora-

tion of the internal steel support structure, and failure of the old organic protective coating applied to the outer surface. The principal aim of the restoration process planned by the authorities will be to maintain the artistic integrity of the structure while restoring it to an appearance in keeping with the artist's original aesthetic.

Jerry Kobylecky

Projects

The Bardo Museum

The Bardo Museum, the principal archaeological museum in Tunisia, houses an extraordinary collection of mosaics from ancient Roman sites all over the country. The museum building and the collection are the subject of a collaborative project of the Institut National du Patrimoine and the GCI to assess the physical status of the building and its effects on the mosaics that are, in many cases, actually part of the building. Staff and consultants of the museum and the GCI are working together on a systematic assessment of the building as the dynamic container for the important collections. Simultaneously, they are undertaking a condition reporting effort focusing on a selected representative set of the mosaic pavements. The work is being managed by the GCI's Gaetano Palumbo, Documentation Program Coordinator. A set of photographs has been made of each pavement, and this spring, the team began the process of examination, annotation, and assessment. The collaboration will result in comprehensive collections management recommendations for the museum staff, as well as a clear understanding of the relation of the historic building to the collections it holds.

Publications

Stone Conservation
An Overview of Current Research

by C. A. Price

Is research in stone conservation "on the rocks"? This volume, part of the GCI's Research in Conservation series, offers an in-depth critical appraisal of the status of stone conservation research today, identifying areas of strength and weakness in the field as a whole. C. A. Price, a noted British archaeological conservation scientist, discusses recent research on the causes of stone decay, as well as current preventive measures, assessment tools, and treatment durability. He also reviews current research on methods of evaluating the effectiveness of these methodologies and treatments. The book includes a comprehensive survey of the literature, draws from conversations with professionals in the field, and provides recommendations for increasing the effectiveness of research, including the improvement of training, symposia, and research programs and the establishment of conservation policy.

C. A. Price is Reader in Archaeological Conservation at the Institute of Archaeology, University College, London.

112 pages, 8½ x 11 inches

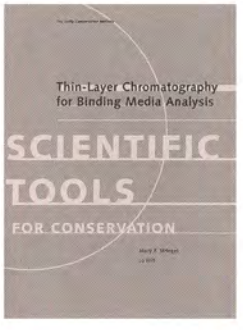
ISBN 0-89236-389-4, paper, $25.00

Thin-Layer Chromatography for Binding Media Analysis

by Mary F. Striegel and Jo Hill

This is the first volume in the GCI's Scientific Tools for Conservation series, which will offer information on scientific procedures and methodologies of practical use to conservators and conservation scientists.

In the study and conservation of art and artifacts, natural organic materials are frequently encountered in components such as coatings, binders, and adhesives. The identification of these materials is often crucial to the attempt to characterize the technologies employed by artists or craftspeople, understand the processes and causes of deterioration, and plan appropriate conservation treatments. Yet the limited resources of many conservation laboratories put many analysis techniques beyond their reach. Thin-layer chromatography can help fill this gap.



The volume consists of a handbook, protocols, and guide to reference materials. The handbook serves as a primer for the basic application of thin-layer chromatography to the analysis of binding media, adhesives, and coatings found on cultural objects; the protocols provide step-by-step instructions for the laboratory procedures involved in typical analyses; and the guide to reference materials aids in the understanding of the types of materials and documentation needed for accurate analyses by thin-layer chromatography.

Mary Striegel received her Ph.D. in inorganic chemistry from Indiana University/Purdue University and currently works as a materials scientist at the National Center for Preservation and Technology and Training in Natchitoches, Louisiana. She formerly worked as an Assistant Scientist at the GCI. Jo Hill, a graduate of the Winterthur Museum/University of Delaware Art Conservation Program, is a conservator for the Fowler Museum of Cultural History at the University of California, Los Angeles.

240 pages, 8½ x 11 inches
65 charts
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Survey of Damage to Historic Adobe Buildings after the January 1994 Northridge Earthquake

by E. Leroy Tolles, Frederick A. Webster, Anthony Crosby, and Edna E. Kimbro

Spanish colonial missions and Mexican rancho and pueblo adobe structures are among California's earliest existing structures and the only above-ground remains of the state's original settlement by the Spanish and Mexican people. The Northridge earthquake of January 17, 1994, resulted in tragic losses to a number of these historic adobe buildings. The earthquake also provided a rare opportunity to assess the damage that can occur to such structures as the result of a large earthquake.

The intent of this study—part of the GCI's long-term commitment to researching conservation measures appropriate for historic adobe structures—was to survey the damage to buildings and make an informed evaluation of their seismic performance. The ultimate goal was to use the lessons learned from the Northridge earthquake and the results of retrofit research to help owners, building officials, cultural resource managers, architects, and engineers to understand the risks earthquakes pose to historic adobe buildings and the necessity for taking considered action to limit those risks.

E. Leroy Tolles, Ph.D., is principal investigator for the Getty Seismic Adobe Project (GSAP), a multiyear project of the GCI. Frederick A. Webster, Ph.D., is a principal with Earthen Building Technologies. Anthony Crosby has been a historical architect with the National Park Service for the past 20 years and is a member of the GSAP Advisory Committee. Edna E. Kimbro is an architectural conservator and historian specializing in the preservation of Hispanic-era buildings and material culture, especially of California.

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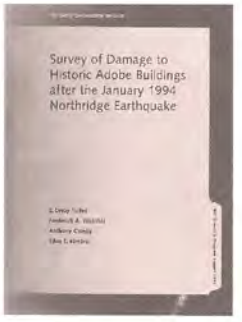

New Publication Series

With the publication of *Thin-Layer Chromatography for Binding Media Analysis*, the Getty Conservation Institute introduces a new series of books specifically directed to the professional community of conservation scientists. As its name implies, the Scientific Tools for Conservation series will provide practical, hands-on scientific procedures and methodologies for the practice of conservation. The series is designed to be of use to conservation scientists, conservators, and technical experts in related fields such as archaeology, art history, and site management. Future volumes will provide information on the use of infrared spectroscopy, photography in conservation, inert atmospheres, and microscopy.

Scientific Tools for Conservation takes its place alongside two other series of books from the GCI Scientific Program: Research in Conservation and GCI Scientific Program Reports. The former presents the findings of research conducted by the GCI and its individual and institutional research partners, as well as state-of-the-art reviews of conservation literature. *Stone Conservation: An Overview of Current Research* by C. A. Price (1995) and *Accelerated Aging: Photochemical and Thermal Aspects* by Robert L. Feller (1994) are the most recent volumes in the Research in Conservation series.

The third series, the GCI Scientific Program Reports, includes the most current research being conducted or contracted by the GCI. New on the list this season is a volume of topical importance, *Survey of Damage to Historic Adobe Buildings after the January 1994 Northridge Earthquake.* Other recent volumes include *Research Abstracts of the Scientific Program*, edited by James R. Druzik (1994); *The Feasibility of Using Modified Atmospheres to Control Insect Pests in Museums* by Michael K. Rust and Janice M. Kennedy (1993); and *Principles of Experimental Design for Art Conservation Research* by Terry J. Reedy and Chandra L. Reedy (1993).

Staff Profiles

Rona Sebastian

Dennis Keeley

Associate Director, Administration

As she was growing up in Los Angeles, Rona Sebastian assumed that one day she would have a career in music. Like her sister before her, she studied piano. She briefly attended the California Institute of the Arts but wanted exposure to more disciplines and so transferred to California State University, Northridge, graduating with a degree in social psychology. Her love of music remained, however, and throughout college and afterward she taught piano, first to children through the Yamaha Music Schools and later to adults privately. The experience of teaching, she believes, helped her learn how to communicate more effectively with a variety of people.

In the early 1980s, while maintaining her teaching, she attended UCLA's Graduate School of Management, earning an MBA in arts management and finance. In addition to teaching, she also worked as a consultant for the next few years and in 1985 became the administrator at the J. Paul Getty Trust for several Getty programs, among them the Grant Program, the Museum Management Institute, and Public Affairs. Two years later she was asked also to temporarily help out at the GCI when its administrator left. Shortly thereafter she became the GCI's full-time administrator.

In 1990 Ms. Sebastian became Associate Director for Administration at the Institute. During the same year she was named acting codirector of the GCI following the director's departure. In this role she had the opportunity to help the Institute during a transitional period by providing a sense of continuity and support for the staff and for the new director, Miguel Angel Corzo.

Today her responsibilities range from policy and planning—and the oversight of all areas of administration—to directing the GCI's move to the Getty Center, and include serving as the Institute's representative to ICCROM and to the Advisory Council of AIC. She also recently managed an Institute project that brought together an independent multidisciplinary advisory committee to study the deterioration of the carved marble lintels from the Church of the Holy Sepulchre in Jerusalem. She enjoys the challenge of dealing with planning for the GCI's future, as well as the day-to-day issues of its operation. One thing she is planning for her personal future is restoring her piano.

Don Lawrence

Dennis Keeley

Engineer, Administration

Although he was born in Southern California, Don Lawrence lived in a half dozen states during his first eight years. His father worked for North American Aviation as a technical representative to the U.S. Air Force, and the family moved to accommodate his nearly annual reassignments to different Air Force installations. In 1958 the family returned to Southern California and remained there.

After high school, Mr. Lawrence worked for a year, then went into the U.S. Army. During 1970 and 1971 he was stationed in Vietnam, where he served as a truck driver. Returning home, he enrolled at El Camino College, where he concentrated on courses dealing with various aspects of building engineering, such as air-conditioning and heating. Pursuing a long-standing interest in art dating to his childhood, he also took courses in oil painting and freehand drawing.

After receiving an associate of arts degree from El Camino, he continued his studies in building engineering at Los Angeles Trade Technical school. Afterward he worked for a variety of businesses, including an automotive air-conditioning installation company, an office furniture manufacturing company, and a hospital. In 1985 a friend of his who had recently begun work at the J. Paul Getty Museum told him about a position at the newly established GCI. Mr. Lawrence applied and the same year became the Institute's first—and thus far *only*—building engineer.

The Institute has grown a good deal since then, and his work has expanded as the size of the facility and the amount of equipment have increased. Any matter involving electrical systems, plumbing, heating, ventilation, air-conditioning, and the phone system—and not requiring a crew—is his responsibility. He has also been involved in implementing the numerous safety measures put in place at the Institute in recent years.

When not at work, he still finds time for his art. Among his subjects are landscapes, animals, people, aircraft, and ships. Since college he has worked with a variety of media, including watercolor, acrylic paint, and oil paint. His favorite at the moment is a basic and durable one—crayon.

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THE GETTY CONSERVATION INSTITUTE

4503 Glencoe Avenue
Marina del Rey
California 90292–6537
Phone 310–822–2299
Fax 310–821–9409