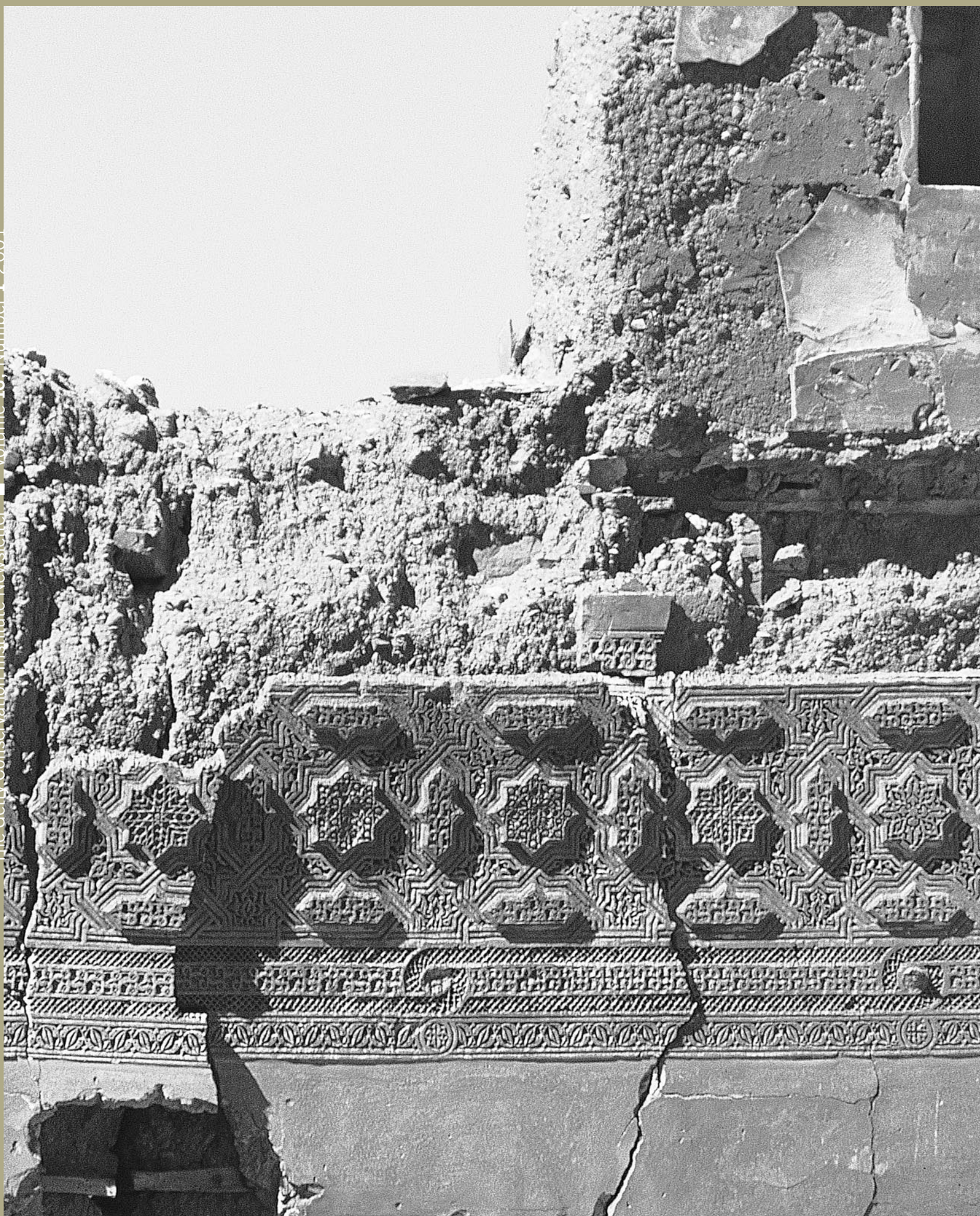
Conservation



The Getty Conservation Institute Newsletter ■ Volume 16, Number 1, 2001

The Getty Conservation Institute Newsletter

Volume **16**, Number **1** 2001

The Getty Conservation Institute works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research into the nature, decay, and treatment of materials; education and training; model field projects; and the dissemination of information through traditional publications and electronic means. In all its endeavors, the GCI is committed to addressing unanswered questions and promoting the highest possible standards of conservation.

The Institute is a program of the J. Paul Getty Trust, an international cultural and philanthropic institution 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

Front cover: Detail of the deteriorating earthen walls of the Telouet Casbah, southeast of Marrakesh in Morocco. *Photo:* Eric Blanc.

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THE GETTY CONSERVATION INSTITUTE

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The Conservation of Earthen Architecture

By Alejandro Alva Balderrama

Feature

Earthen architecture is one of the oldest forms of construction. It is composed of structures made from unfired earthen materials, including adobe (or sun-dried mud brick), rammed earth, and a host of other earthen components and construction techniques that vary from culture to culture and region to region. Not only do earthen materials serve as the primary structural element in such architecture, they are also often used for rendering or for decorated surfaces.

The tradition of building with earth is evidenced the world over. In many parts of Africa, Asia, and Central and South America, earth remains a prevalent building material. According to the United Nations, an estimated 30 percent of the world's population lives in houses made of earth.

The variety of earthen structures ranges from simple forms to vast, monumental sites of high complexity. Indeed, earthen sites compose 10 percent of the World Heritage List of UNESCO. But many significant sites are threatened; 16 of the 100 places on the World Monuments Watch 2000 List of 100 Most Endangered Sites—as well as 57 percent of the sites of the World Heritage List in Danger—are of earthen construction.

Commonly perceived as only a vernacular form of architecture, new earthen construction—abetted by the environmental movement—has seen increasing standardization and industrialization in recent decades. But the conservation of earthen architecture has been slower in its evolution. Progress in conservation and in new earthen construction is in many ways interreliant; the continuity of the tradition of building with earth informs conservation practice, while preservation of this important architectural legacy inspires its future use. Yet conservation of earthen architecture is still coming into its own as a discipline.

Two series of events in the last 30 years have profoundly affected the development of the field. The first is a sequence of international conferences on earthen architecture conservation that began in Iran in 1972 (see sidebar, page 10). Eight international conferences have been hosted in total, the most recent in Torquay, England, in May 2000. Each conference made its mark on the earthen architecture landscape by articulating the needs of the field, motivating particular activities, and promoting a network of practitioners around the world.

The second set of events was a series of educational activities for professionals in the conservation of earthen architecture. The Pan-American Courses on the Conservation and Management of Earthen Architectural and Archaeological Heritage (known as the "PAT" courses) offered from 1989 to 1999—in addition to a host of regional workshops, courses, seminars, and other educational initiatives—built skills in this challenging area of conservation and advanced the field of study related to earthen architecture conservation. As with the conferences, these activities have fostered the development of the field. The exchange between the more global conferences and the specific educational activities has itself spawned important field projects, research initiatives, and advocacy efforts.

An Awakening Interest

In some places, earthen architecture dates back millennia, while in others it represents a recent development. Today it is a growing field. New avenues are opening for its study as this building

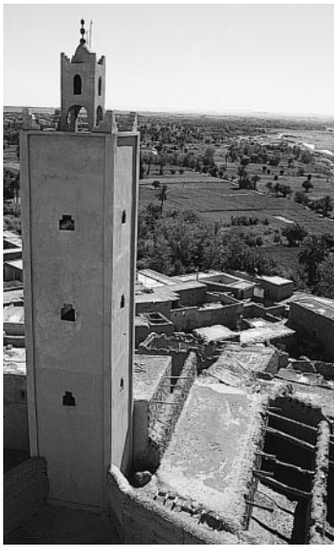
Earthen Architecture around the World

Morocco

Below and above: Two Casbahs in the Dades Valley, sometimes called the valley of a thousand Casbahs.

Far right: A Casbah in Tifoultoutte, overlooking the Drâa Valley.

Photos: Eric Blanc.



tradition comes to be recognized as an indispensable part of our heritage. There is new interest in conserving culture through the development of earth-building skills. The tradition embodied by the various cultures of construction—using earth or other materials—is not, as cultural homogenization would suggest, "an illusion of permanence." Rather, such a tradition provides a foundation for a modernity that acknowledges specific identities. Today more than ever, such approaches are needed to respond to cultural homogenization and globalization, which threaten the values, origins, and expressions of identities of countless communities.

Interest in the study and conservation of earthen architecture grew during the last half century. The 1950s and 1960s witnessed the first formal indications of this interest. At the first international conference on earthen architecture, held in Iran in 1972, the keynote address acknowledged earthen architecture as "the oldest and most widespread" architectural expression of our monumental heritage.

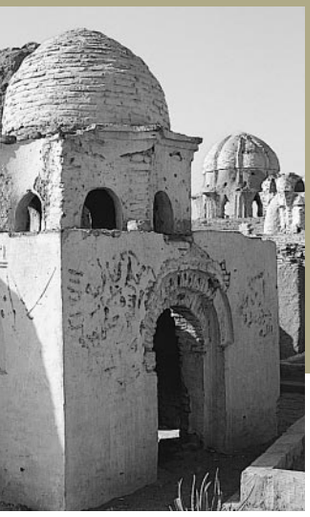
The recommendations that grew out of subsequent meetings reflected the vast array of issues in the field. In part, the conferences contributed to an awakening of a consciousness regarding monumental earthen architecture and its pervasiveness. But just as importantly, the gatherings also noted the necessity to promote the conservation of earthen architecture through study and the application of conservation skills.

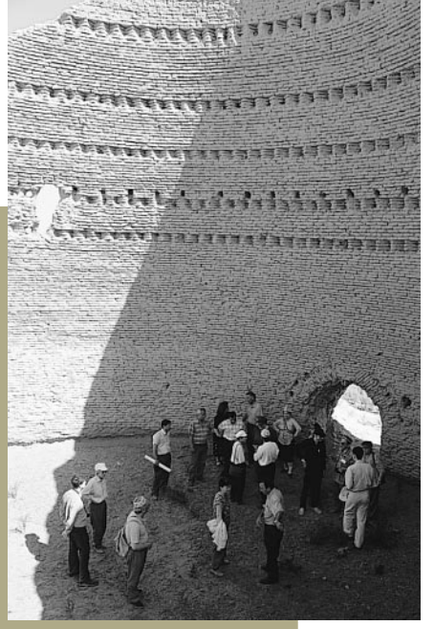
For many years, these conference conclusions remained mere declarations. Efforts to take on specific problems—particularly in archaeological zones—consisted mostly of "solutions" to problems encompassing only small areas of physical material. This approach grew out of the widely held orientation of traditional conservation toward solving material problems by modifying the physical and chemical properties of the original material—or, in the best of cases, through some protection of exposed structures.

The plenary sessions of these international conferences not only recognized the importance of our architectural heritage built of earth but also encouraged a comprehensive exploration of issues involved in conserving that heritage. In relating the conservation problems of earthen architecture to issues of education, research, professional practice, public awareness, methods, and other elements of this complex cultural expression, it became clear that earthen architecture conservation could not be reduced to an intervention aimed at stabilizing or consolidating a given surface or wall. Treatment with such and such a product or a focus on a stabilized square meter or square centimeter were not approaches that successfully could promote the conservation of such an enormous, yet fragile, architectural heritage.

Egypt

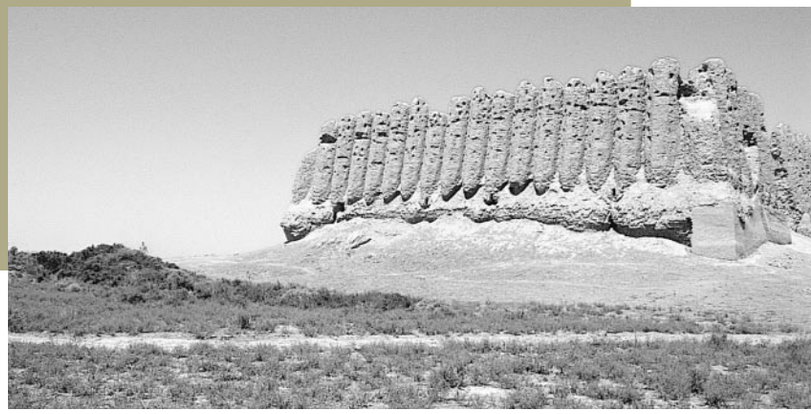
Two views of tombs in the ancient Muslim cemetery in Aswan. The several hundred tombs at the site were built between the 8th and 12th centuries. *Photos:* Eric Blanc.





Turkmenistan

Two of the remaining structures at the ancient site of Merv, which dates back to the 6th century B.C.E. A series of cities occupied the site for a period of over 2,000 years. *Photos:* Neville Agnew.

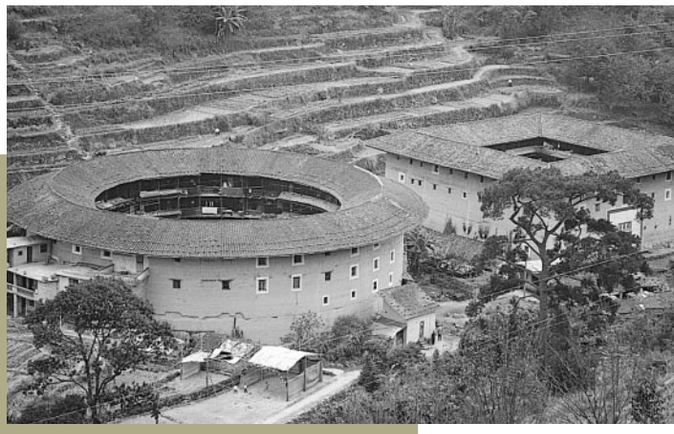


The Need for Education

While the fourth international symposium on earthen architecture, held in Peru in 1983, reiterated the need for intensive educational programs, it was not until the fifth symposium in Rome in 1987 that the International Centre for Earth Construction–School of Architecture of Grenoble (CRATerre-EAG) assumed responsibility for such programs. Two years later, the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) agreed to share that responsibility.

Educational activities in the period from 1989 to 1994 brought the complex character and needs of earthen architectural heritage to the attention of the academic and professional communities dealing with architecture and its conservation. To preserve the cultural tradition of earthen construction, a dialogue was required between conservation-oriented disciplines and disciplines focused on new construction and planning. It was necessary to emphasize the relationship between tradition and modernity as a way to preserve earthen architecture as a resource and a "constructive culture." In terms of training, this meant teaching those charged with the conservation of earthen architecture about construction materials and techniques. They needed to experience the use and application of earthen materials in order to understand their behavior and preservation. At the same time, those engaged in new construction needed more understanding of the past. Only a vision for the future based on a profound knowledge of history and of local and regional traditions could counteract the devastating effects of acculturation.

The 1989 agreement between CRATerre-EAG and ICCROM on educational programs led to their formation of the Gaia Project, which conceived of creating intensive on-site education. Initial optimism for the institution of an on-site educational program rapidly faded in the face of a series of obstacles. Then, in 1994, a proposal from authorities in Peru and contact with the GCI Training Program resulted in the institutional cooperation that led to the joint organizing of PAT96, the first major on-site educational program on the conservation of earthen architecture. Later, another agreement was reached for developing a new institutional collaboration program between CRATerre-EAG, the GCI, and ICCROM that would supplant the Gaia Project. Called Project Terra, the initiative organized PAT99. Today it serves as an institutional framework for the Terra Consortium and for several research activities now under way (see page 19).



China

Upper left: Earthen remains at Jiaohé, a Silk Road site in northwest China. *Photo:* Francesca Piqué.

Above: Two rammed-earth, multistory defensive dwellings constructed by the Hakka people in Fujian Province. *Photo:* Neville Agnew.

Lower left: The Jade Gate, the west end of the Han dynasty's Great Wall. *Photo:* Po-Ming Lin.

Regional Efforts

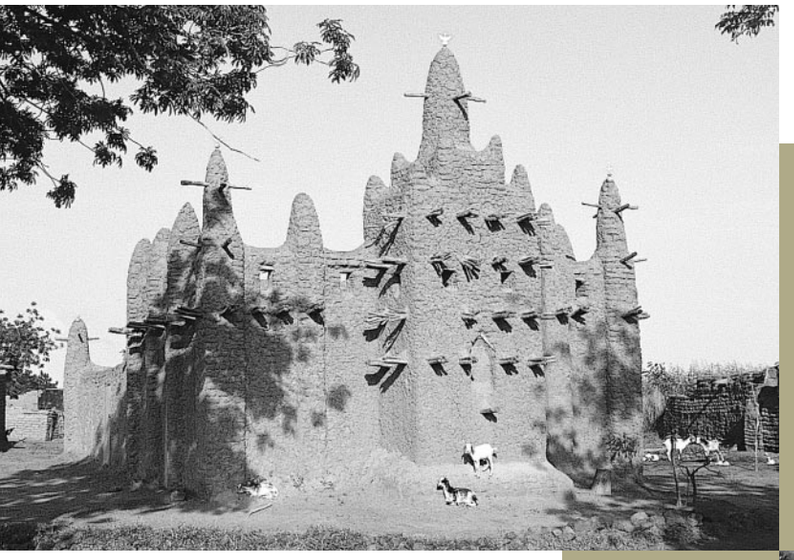
While policies and approaches can be promoted internationally, substantive action must occur at the local and regional levels. During the 1990s, several regional activities significantly advanced the cause of earthen architecture. Of particular importance was work in Portugal, England, and Italy.

In Portugal, the Bureau of Buildings and National Monuments (DGEMN) assumed responsibility for organizing the seventh international conference of earthen architecture—Terra93, as the event was known. Besides working for broad international professional participation at the conference, the DGEMN promoted earthen architecture conservation education among professionals and the general public with the opening of the "Des architectures de terre" international exhibition in Lisbon. At the conference, the basis was laid for what would later be PAT96 and then PAT99. In addition, among other efforts, the DGEMN encouraged the earthen construction of the new municipal library in the historic city of Silves (the venue for Terra93) and the establishment of a course for craftsmen of earthen construction at the Escola Nacional de Artes e Oficios Tradicionais in the Portuguese city of Serpa.

The Terra93 conference also helped spark other regional initiatives, including the 1994 "Out of Earth" conference in Devon—the first national conference in the United Kingdom on the conservation of earthen architecture. This conference followed the creation of the Earth Structures Committee of ICOMOS/UK and the establishment of the National Centre for Earthen Architecture at Plymouth University in Devon—both of which were encouraged by English Heritage. All three organizations together hosted the 8th International Conference on the Study and Conservation of Earthern Architecture, held in Torquay, Devon, in May 2000.

An important aspect of Terra93 in Silves was the Italian presence, with representatives from Sardinia and others from academic and professional communities. Italian interest in the study of earthen architecture extends back several decades; today, there are no less than nine study groups centered at Italian universities working on research and education for earthen architecture. In addition to these groups, there are a number of professional associations for the study and promotion of earthen architecture in various regions of Italy. Certain regions such as Sardinia and Abruzzi have strong cultural support—and therefore political support—for the traditional use of earthen architecture.

The Italian experience is characterized by academic and scientific rigor, the integration of methodologies for planning the conservation of historical centers built out of earth, and the



Mali

Left: The mud brick mosque in the city of Mopti on the Niger River.

Below: Granaries in the village of Banani, east of Mopti.

Photos: Guillermo Aldana.

opportunity for defining a national policy for the study and conservation of earthen architecture, based on a major cultural movement that promotes it. A milestone event was the Conference of Quartu Sant'Elena in 1990, the first of a series of events in Italy that led to the establishment of the National Association of Districts of Earthen Architecture. This association of municipalities with a tradition of earthen architecture is significant because of the strong influence that Italian regional governmental authorities have on the management and development of the built and natural environment. The charter of the association was signed at another conference in Quartu Sant'Elena—Terra Cruda 2000—held 10 years after the first.

Action for the Future

The vision and hard work of innumerable persons contributed to the initiatives and events mentioned above. Of equal importance was the role played by international organizations. These organizations have facilitated, promoted, and—with their presence and authority—sanctioned these valuable efforts. They likewise have contributed to the dissemination of ideas, placing them in a world perspective and facilitating access to information.

Still, it would be an illusion to treat such achievements as indicative of overall success in the study and conservation of earthen architecture. While in some regions it is now more possible to improve policies regarding this heritage, the majority of the world has yet to implement significant measures promoting earthen architecture and its conservation. Entire regions where earthen architecture is a fundamental part of the culture and heritage have been insufficiently influenced when it comes to responding to architectural acculturation. The historical heritage of earthen architecture is in jeopardy, disappearing from a great part of the planet either through negligence or because it is being replaced by other forms of construction. Governmental authorities frequently consider earthen construction to be substandard, even though it may meet the housing needs of the population more appropriately than other building materials and techniques.

In a handful of cases—after years of academic, institutional, and professional efforts—some earthen architectural heritage enjoys a degree of sponsorship, thanks to legislative action. Achievements have also been made in creating awareness as to earthen architecture's importance. In addition, the lists compiled by international heritage organizations have had some effect in retarding irreparable losses of these treasures. In rare instances—at Chan Chan in Peru, at Joya de Cerén in El Salvador, and in a few historic

France

Left: A typical farmhouse in Brittany, probably over a century old.

Above: A family house in the Alsace region.

Photos: © CRATerre-EAG.

city centers—comprehensive measures are being put in place for long-term preservation. Even so, the concepts of planning and management still lack sufficient acceptance in the field of conservation to be able to redirect efforts away from traditional, narrowly focused treatment approaches.

In coming years, as the architectural acculturation already under way becomes more acute, new, ongoing, and diverse responses for conserving earthen architecture will be needed. Such responses must integrate all the issues involved and take into consideration the vast range of local and regional conditions.

In some instances, these responses will find support in legislation that imposes regulations to protect the heritage. In other cases, support will come through the promotion of planning and management, or through capitalizing on ecological agendas, such as bioarchitecture and sustainable construction. The ecological approach suggests scenarios in which the conservation field—in its own interest—will have to promote new earthen construction and planning. International organizations will need to encourage specific activities in specific regions to increase political and administrative awareness of earthen architecture. Because all political and administrative responses are founded upon a solid cultural base, these movements must be built upon that base. The issue of conserving earthen architecture is no exception.

The conservation of earthen architecture requires an integration of actions: cooperation, the synergy of disciplines and initiatives, building and maintaining institutional and professional networks, the promotion of study, and a rigorous consideration of cultural diversity. Even so, we should not be obligated—for the umpteenth time—to justify our concern over the issue, in particular among the professional community and institutions presumably interested in conserving this heritage. Paraphrasing the text of an amusing book published several years ago, we could say, "There are so many without whom all of the above would have been impossible. There are many others [who fortunately are less in number] without whom all this would have been a heck of a lot easier."

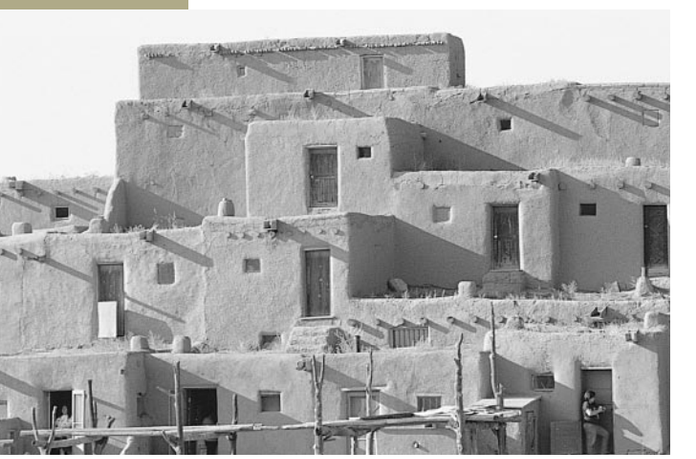
A renewed commitment to the conservation of earthen architecture and the promotion of its values is essential for this heritage to be universally recognized as an area of study and of professional practice. And it is the study of earthen architecture—and a continued search for new and better ways to conserve it—that will allow us to build upon the foundation of a field already rich in reflection, conviction, and passion.

Alejandro Alva Balderrama is the director of the Program on Architecture and Archaeological Sites of ICCROM and codirector of Project Terra, a collaborative project of CRATerre-EAG, the GCI, and ICCROM.

United States

Left: Two homes in Geneva in upstate New York, constructed of mud brick in the 1840s. ***Photos:*** Richard Pieper.

Right: The Sacred Heart Church at Nambe Pueblo and the Taos Pueblo, both in northern New Mexico. ***Photos:*** Eric Blanc.



International Conferences on Earthen Architecture

Premier colloque international sur la conservation des monuments en brique crue
Yazd, Iran — *November 25–30, 1972* — Conseil International des Monuments et des Sites et ICOMOS-Iran

Deuxième colloque international sur la conservation des monuments en brique crue
Yazd, Iran — *March 6–9, 1976* — Conseil International des Monuments et des Sites et ICOMOS-Iran

Third International Symposium on Mud-brick (Adobe) Preservation
Ankara, Turkey — *September 29–October 4, 1980* — ICOM–ICOMOS Turkish National Committees

International Symposium and Training Workshop on the Conservation of Adobe
Lima and Cuzco, Peru — *September 10–22, 1983* — Regional Project on Cultural Heritage and Development, UNDP/UNESCO and ICCROM

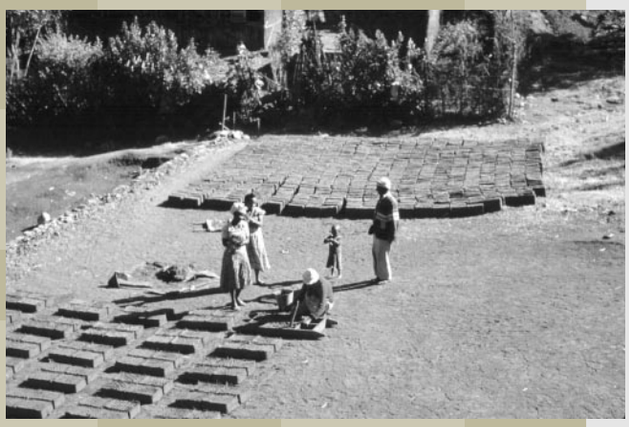
Fifth International Meeting of Experts on the Conservation of Earthen Architecture
Rome, Italy — *October 22–23, 1987* — ICCROM and CRATerre

Sixth International Conference on the Conservation of Earthen Architecture (Adobe90)
Las Cruces, New Mexico, U.S.A. — *October 14–19, 1990* — Getty Conservation Institute, Museum of New Mexico State Monuments, ICCROM, CRATerre-EAG, and the U.S. National Park Service—Southwest Region

Sétima Conferência Internacional sobre o Estudo e Conservaçâo da Arquitectura de Terra (Terra93)
Silves, Portugal — *October 24–29, 1993* — Direcção Geral dos Edifícios e Monumentos Nacionais

Eighth International Conference on the Study and Conservation of Earthen Architecture (Terra2000)
Torquay, England — *May 11–13, 2000* — English Heritage, University of Plymouth, ICOMOS/UK Earthen Structures Committee

Contemporary Production of Earthen Material



Left: The production of mud bricks for homes, just outside Addis Ababa, Ethiopia. *Photo:* © CRATerre-EAG.

Right, top: Mud brick production for use in the construction of homes in Yunnan Province, China. *Photo:* Neville Agnew.

Right, bottom: Mechanized production line of stabilized compressed earth blocks in Isère, France. *Photo:* H. Guillaud (© CRATerre-EAG).

Contemporary Buildings Constructed from Earthen Materials

Left and below: Housing in Auroville, India, and Isère, France. *Photos:* S. Maïni, T. Joffroy (© CRATerre-EAG).

Right, top: An exhibition building in Janadryah, Saudi Arabia. *Photo:* T. Joffroy (© CRATerre-EAG).

Right, bottom: A modern structure in Cairo, Egypt. *Photo:* Eric Blanc.

Conservation and Continuity of Tradition

A Discussion about Earthen Architecture

From its earliest days, the Getty Conservation Institute has sought to advance the preservation of earthen architecture, including earthen archaeological remains, through research in the laboratory and in the field, and through education. These efforts have included work on adobe (sun-dried cast earthen bricks)—in particular, adobe consolidation and seismic strengthening of adobe structures. The GCI is also participating in Project Terra, a program for the study and conservation of earthen architecture that is a collaboration with the International Centre for Earth Construction–School of Architecture of Grenoble (CRATerre-EAG) and the International Centre for the Study of the Preservation and the Restoration of Cultural Property (ICCROM). *(See page 19.)*

We recently asked several specialists in earthen architecture conservation to share with us their views on the state of the field. Anthony (Tony) Crosby—a conservation architect in Colorado—has for 30 years worked in the protection of heritage sites in the United States and internationally for the U.S. National Park Service and in private practice. Hugo Houben—cofounder of CRATerre and codirector of Project Terra—has specialized in earthen construction since 1972 and worked in over 50 countries. John Hurd—a private conservator in architectural and archaeological conservation—has been involved in the conservation of over 40 earthen structures in the United Kingdom and serves as a consultant to several projects in China and central Asia. All three are board members of the ICOMOS International Committee for the Study and the Conservation of Earthen Architecture.

They spoke with Neville Agnew, a GCI principal project specialist who has worked extensively on adobe research, and with Erica Avrami, a GCI project specialist who serves as the Institute's project manager for Project Terra.

Neville Agnew: *I'd like to begin by discussing the historical continuity of earth as a material for human habitation.*

Hugo Houben: From what we know, the most ancient urban settlements were built with earth. It is believed that at least one-third of the world's population still lives in earthen structures. For those reasons, earthen architecture should be acknowledged as the world's most ancient and most widespread existing architectural expression.

John Hurd: I've just returned from central Asia, where I visited the ancient city of Otrar in Kazakhstan, which was Tamerlane's westernmost capital. At that site are seven earthen cities built on top of one another—the earliest dating from the first century before the Christian era, the latest dating to 1400. Just being there brought that continuity home to me in an extraordinary way.

Neville Agnew: *Based on your personal experience, what are some of the important earthen sites internationally—including both archaeological or historic sites and inhabited sites?*

Hugo Houben: Well, you have lots of sites, like the over 4,000-year-old Mari site in Syria, for example. There's the city of Shibam in Yemen, which has existed for about 2,500 years. The pueblos of the U.S. Southwest are another example, and of course there's the 6th-century site of Joya de Cerén in El Salvador. In Ecuador, there's the historic core of Quito. In Peru, there's the 9th- to 15th-century site of Chan Chan, as well as the center of Lima. In fact, there are a great many earthen sites.

John Hurd: What about the Great Wall of China? There are 2,000 kilometers of it in northwest China made from earth. As I mentioned, I've just come from Otrar, which occupies an area of 120 square kilometers. Other extraordinary sites in central Asia include Merv in Turkmenistan, which dates to the 6th century before the Christian era, and the 2,000-year-old city of Bam in Iran.

. . . in most places in the world, earth *is* the conventional building material.

Tony Crosby

Erica Avrami

Tony Crosby: We also need to think about earthen sites that have become important because of the conservation research that's going on there. Joya de Cerén is one of those. The Tel Dan gate in Israel, which dates from the Canaanite period—about 1800 B.C.E.—is another, to some extent.

Hugo Houben: I'd like to point out that last year 16 percent of the World Monument Watch's 100 most endangered sites were earthen sites. Ten percent of UNESCO's World Cultural Heritage List is earthen architecture. And 57 percent of the UNESCO World Heritage Convention list of world heritage sites in danger are earthen sites.

Neville Agnew: *Has the attention that earthen architecture has received in the conservation field been less than that received by historic and archaeological structures made from other materials, such as stone and timber?*

Tony Crosby: I think we have a lot of examples where, in fact, we can say that that's true. A more important question would be, "why is that true?" I remember when the U.S. National Bureau of Standards did its initial work on earthen architecture materials in the late 1970s. One of its publications began with the premise that in many places in the world, earth is used as a building material when more conventional materials are lacking. It struck me that in most places in the world, earth *is* the conventional building material.

John Hurd: I've never understood it, but wherever I go, people assume that earthen structures are unimportant or in some way more primitive than buildings constructed with other masonry materials. People also seem to assume that they're inevitably in decline and not conservable in some way—except possibly in the area of freshly excavated archaeology, where there seems to be a great deal of appreciation and respect for the material.

Hugo Houben: In 1957 the United Nations published the first book on earthen architecture. It mentioned that in places such as France, Germany, and central Europe, one could find earthen architecture, but that it was limited to applications in minor, rural buildings. Today we know that to be totally untrue. Earth has been used to build every kind of building, with no limitations on size or significance. Except for a few documents, you won't find in technical publications on art and architecture any reference to earthen architecture. The history of earthen architecture has never been looked at. As a consequence, earthen architecture does not have a history. It's perceived as unimportant.

Neville Agnew: *Does that have something to do with the fact that earthen architectural structures are classified as vernacular, as distinct from the sort of high art of classical architecture and stone and wooden construction?*

John Hurd: In a way, earthen construction is perceived as something anyone can do. And therefore it doesn't quite fall into the category of "decent" architecture.

Tony Crosby: We are talking about public awareness, not actuality. There are different levels of public awareness, and there is probably something of a disconnect between official public awareness, if you will, and local public awareness. As an example, a local community might have more interest in an earthen historical structure or site—its value being related to some local event or history—than someone evaluating it from the outside who doesn't have that local knowledge but does have some sophisticated understanding of architectural significance. The level of interest in a site is related to its perceived values.

Erica Avrami: *Has there been some change over the last 30 years, within the conservation community, that has increased the recognition that this is important heritage that needs to be preserved?*

John Hurd: We have a problem, and that is that over the last 30 years, we've had an awful lot of bad examples of conservation of earthen buildings. I see a lot of cement work that's been done to try to conserve an earthen structure. People are used to seeing failure in this area of conservation. There is a change inasmuch as we can now offer a new understanding and a new kind of analysis of the problems. And better conservation methods are being developed. Also, there's a lobby of people interested in sustainability that's become very important. That group has been an ally to us in conservation, because through our work, we have a better understanding of sustainable architecture than anyone else. So we have something to offer.

Tony Crosby: I'm not sure we have a higher percentage of good examples of conservation intervention today then we had 30 years ago. We just have more of them. But I think we probably have more poor examples, too.

Hugo Houben: Historically, the attitude that we've seen toward earthen sites is negative compared to stone sites. Often the size of the resources for earthen conservation does not match the scale of the problem. The field of earthen architecture conservation is quite sick of small thinking, small action, small budgets, small know-how, small planning, and small research. Earthen architecture is big.

Neville Agnew: *That's right. That's the point. Do you think some of these sites are capable of being saved? Chan Chan, for example? Or some of the central Asian sites that John was mentioning? Can they be saved for the future?*

John Hurd: Yes, of course they can. A key thing is training and advocacy. The whole thing that I'm about in Otrar is to train local people and local institutions and to get indigenous conservation programs going. We don't want to lose the art of building with earth in countries where it's still practiced. I fear it disappearing all over the place, despite my confidence. I'd love to see professionals in the West disseminating the facts that this is a very useful form of architecture and that it may be the most appropriate building form in parts of the world.

Tony Crosby: The problems we face in conserving places like Chan Chan are immense. Perhaps with more knowledge of the deterioration process, a better understanding of interventions that are most appropriate, and more education—particularly regarding the importance of earthen monuments—the future will be brighter.

Neville Agnew: *Let's discuss the nature of the threats to historic and archaeological earthen structures. What are the great challenges posed by these sites?*

John Hurd: Earthen structures are inherently more easily damaged by environmental conditions then other forms of masonry. Unless the buildings are maintained and have a roof and so forth, they are easily destroyed. Once an archaeological site has been uncovered, there's a threat from salt and wind and from the enormous change of temperature that you get in the desert. A great challenge is figuring out how to minimize the effect of these harsh environmental factors.

Tony Crosby: In general, the major threats are environmental and then human. The human threats range from vandalism to a less-than-adequate response—the latter probably being the greater threat. And a less-than-adequate response is the product of a lack of a comprehensive understanding of the effects of those things John mentioned—such as thermal shock and salt. Another threat would simply be the need to answer age-old questions that haven't been answered yet. We still don't know enough.

Neville Agnew: *That brings us to the next question—what are the research needs and priorities in earthen architecture conservation?*

Hugo Houben: A number of research needs were identified during the Terra 2000 research meeting in May 2000 and outlined in the summary report.* I'm very much an advocate for first understanding the fundamental things. What are the exact binding and unbinding mechanisms of earthen materials? What is the importance of the mineralogy of the materials? What is the importance of organic material? What is the importance of water and salts? As long as we don't answer those basic questions, we'll go another thousand years observing the material and trying to make out what is needed.

Neville Agnew: *You're saying that research needs include acquiring a fundamental understanding of the mechanism of deterioration, the way in which earthen structures literally fall apart.*

Hugo Houben: That's my personal feeling. On the macro level, the general mechanisms don't seem to be that complicated. What is a bit more complicated is how it all functions on the micro level.

Neville Agnew: *When we consider the materials in earthen construction—the clay, the silt, and the sand components, and then organic materials, such as straw—we've got a very complex composite.*

* The report is available on the Getty's Web site at: www.getty.edu/conservation/resources/reports.html

The field of earthen architecture conservation is quite sick of small thinking, small action, small budgets, small know-how, small planning, and small research. Earthen architecture is big.

Erica Avrami

Hugo Houben

Hugo Houben: Yes. We have to think about the clay, but fundamentally we also have to think in terms of the compound. Earth must be considered as a composite material.

Erica Avrami: *I think there needs to be a greater understanding of exactly how this material behaves. What are the critical points at which it begins to decay, and why? Of course, that sort of research takes a lot of time and resources. We still need to look at issues such as seismic threats, decorated surfaces, sheltering, reburial, and options that, at least for now, provide us with the best possibility for preventing further deterioration.*

John Hurd: I agree with everything Hugo said, and I don't work in a research facility. I'm a conservator, and my research goes hand in hand with my conservation treatments. Obviously, I bring in all the technology that I can, but because I don't necessarily have the information that I need on a technical level, I have to work largely on an empirical level. As part of that, I go to the local people for the empirical understanding that they have. I'd love to see more recording and analysis of existing traditions while they are still alive, because they are fast disappearing. Yes, we need to know a great deal. And it will cost a great deal. And it will take a great deal of time. Meanwhile, monuments are falling apart, and I'm being asked to rescue them. Much more empirical understanding—an understanding of existing practices—would be very useful.

Neville Agnew: *I'm hearing three things here: fundamental scientific studies, pragmatic testing and development of methods for conserving historic archaeological sites and structures, and, finally, preserving traditional folk knowledge that could inform current conservation practice.*

Hugo Houben: While I'm not for putting one in front of the other, I am pleading to at least start work on the fundamentals, which has never been done. Like John and Tony, we are working in the field with the practical knowledge of local people and with empirical understanding. People argue that going into the fundamentals will take time and that, in the meantime, monuments are falling down. That is, unfortunately, true. But we have to acknowledge that in many cases, monuments are falling down because of empirical approaches and a lack of fundamental understanding.

Neville Agnew: *How do we reconcile the use of traditional repair methods with the high-tech conservation solutions? How do we strive for an appropriate balance?*

Tony Crosby: We have to evaluate equally all potential solutions for the decaying process. Whether it's a traditional solution or a high-tech one that's never been used before, it should be evaluated with the same parameters and the same guidelines. Too often we probably attribute more validity to traditional means then they may warrant. One example is the plant mucilage used in the consolidation of the walls at Joya de Cerén, a World Heritage Site. The material is a traditional local remedy. The result I've seen is that while it provides some resistance to abrasion, it is not "the solution" to the site's conservation problems. A great deal of research is going on there, which is leading to a better understanding of the cause-and-effect relationships of deterioration. This understanding will result in the utilization of different interventions, both traditional and nontraditional, based on their response to identified problems. We can learn much from traditional approaches, but we need to evaluate them with the same rigor that we apply to all potential interventions.

Neville Agnew: *Sometimes high-tech solutions are criticized as being inappropriate or ecologically insensitive. Also, there's been a question of their cost.*

Hugo Houben: Some high-tech solutions reflect a bit of arrogance—"we're going to solve the problem in a minimum of time, don't worry!" Some of those solutions are causing big problems today. But I hope that in the future we can come to high-tech solutions with modesty and really do the job. It's going to take patience and research to combine tradition with high tech. But I think we can come to satisfying solutions that combine traditional know-how, environmental sensitivity, and scientific knowledge. But, as John said, it's urgent that we go out and observe and register traditional knowledge before it's too late.

Tony Crosby: Something that was high-tech 500 years ago may now be traditional, and something we consider high-tech today may be traditional 500 years from now. Obviously, there are numerous tools that we need to take advantage of, and we are lucky today that we have more than someone did in the past. In the future, they'll have even more.

Erica Avrami: *There seems to be a tension between what is considered "international conservation policy"—things dictated by conservation charters—and the ways in which we approach the conservation of earthen architecture. For example, using sacrificial renders and the replacement of deteriorated material. There are things we do in the field that wouldn't be acceptable by those international standards in the area of stone, for example, or timber in some cases. Perhaps we could discuss this in the context of the involvement of the local community and the maintained vernacular nature of the material and of the architecture.*

John Hurd: I don't agree that we behave differently between earth and stone and wood in inhabited structures. I'd probably cut out a rotten bit of wood, replace it with a new piece that takes up its load, and do it in such a way that my patch is reversible. And I would record it. Likewise in a stone building, stones have been turned or replaced. In an earthen building—a standing structure or a weak archaeological structure—the same things would apply. The point about community involvement is an interesting one. I find that local communities are surprised that an international expert is interested in what they are doing. I'm fortunate enough to go to areas where earthen architecture remains a living tradition and where there's lots of community involvement. Everyone wants to give their two cents on how you should do it. I don't find that to be true when I'm dealing with timber monuments. There is something special about earth. It connects to the vernacular spirit in ordinary people, rather than just to professionals.

Hugo Houben: We are quite often on sites where tradition is still alive and where the buildings are still in use. Even if the buildings are historic and only used once a week for ceremonies or other things, community involvement remains strong. Sometimes this leads to better maintenance, but in other cases it may lead to destruction.

Neville Agnew: *There is a valid, fundamental difference in the treatment of inhabited buildings and that of excavated or uninhabited historic structures. Should the conservation profession respond differently to historic, uninhabited earthen structures than to inhabited ones?*

Tony Crosby: In the broadest sense, we are dealing with a more complex system. The addition of modern conveniences introduces factors that may generate moisture or heating—basically things added for human comfort. For the conservator, it's a matter of compromises. You treat things based on their value. And for inhabited structures, one of the values is that of a shelter.

John Hurd: It has a lot to do with the sacrificiality of the system that you use in conservation. If I were working on an inhabited building, although I would want my introduced material to be sacrificial to the wall—in other words, for it to decay rather than for it to decay the wall—it would depend on its hydrophilic nature, hardness or softness, and so forth. If I were working on an ancient site, I'd be more cautious about the sacrificiality of my system and would make it more sacrificial, softer, and more hydrophilic, possibly. So that would be a major difference.

Neville Agnew: *Does reburial of excavated archaeological earthen constructions—ones that are particularly difficult to save—represent the ultimate solution?*

Tony Crosby: Reburial is a limited application in terms of the values that you are protecting and consequently presenting. With reburial, you're saying that the research potential of a site is its most important value. Obviously, that potential can be protected best that way. The other limitation of reburial is physical. It seems to me that it is pretty limited in the practical sense of fairly small walls and small objects.

Neville Agnew: *I wasn't thinking about unexcavated sites but, rather, excavated sites that had been preserved for centuries underground. Places like Tel Dan, for example, that are particularly difficult to conserve.*

Tony Crosby: In a site that's been excavated—that's suffered through that process of rapid drying and excavation shock—there may be an intrinsic failure in the building systems that we'd probably have a difficult time reversing.

John Hurd: When you're confronted with a site of 120 square kilometers, the recommendation for 90 percent of the site will be reburial, because the environmental factors are so severe that after a year or

There is something special about earth. It connects to the vernacular spirit in ordinary people, rather than just to professionals.

John Hurd

Ben Gourley

two the structures will be gone. What remains visible in those sorts of environments would nearly always need some shelter structure protecting it.

Tony Crosby: With respect to shelters, we need to look at more ways to construct low-cost, temporary shelters with local material and local techniques, rather than simply construct permanent sheltering. And I mean something as simple as protecting a small archaeological site overnight. There are basic principles that are important and easy to teach. The goal is to promote that approach rather than to rely on long-term permanent solutions in these traumatic deterioration situations.

Neville Agnew: *What is the future of new construction in earthen architecture?*

Hugo Houben: The future is bright. All through Africa, Latin America, and Asia, there are thousands of small enterprises that have been set up that are working with it. They are asking for more training, documentation, and testing standards so they can become involved in public building programs. In industrialized countries, earthen architecture activities stopped in the 1950s and 1960s. Today they're going on again. But it's still insignificant compared to general building activities. In Germany, for example, you have a total of something like 200,000 new buildings constructed each year. If you have 1,000 constructed with earth, that would be a lot.

Erica Avrami: *Tony, is this mirrored in the U.S. Southwest in new construction in earth?*

Tony Crosby: Absolutely. A lot of fairly prominent international architects have worked in the Southwest, and a lot of local architects continue to work with that material. Of course, some of the appreciation is not for the material itself but, rather, for the traditional forms. So you also see in the Southwest an awful lot of pseudo-earthen architecture made from completely different materials, such as concrete.

John Hurd: In the United Kingdom, there's an upsurge. It's not a huge figure, maybe 50 to 100 structures a year, built by owner-builders looking for sustainability. But there is a renaissance here. In a way, it was always a cottage industry. In other parts of the world, it's very healthy. In Afghanistan, if you want a house built, they will assume you want to build in earthen block. And likewise, all through central Asia.

Tony Crosby: An opposite example would be if you traveled along the upper Nile today. Ten years ago, you didn't see any small structures of reinforced concrete. Today you see a lot of them. And what are they replacing? Earthen structures.

Neville Agnew: *Hugo, given that earth construction is the weakest unreinforced masonry, to what extent is seismic strengthening incorporated into new construction in seismic zones? In California, the use of concrete to seismically strengthen historic adobes has been tremendously invasive. That's one of the reasons we undertook our seismic adobe project at the GCI.*

Hugo Houben: People have started to realize that for small structures—one to two levels—reinforcement should be rather simple. At one time it was thought that reinforcement should be concrete, which made it much more expensive. Today we know that when you are making nonhomogeneous structures, you have more problems and failure than when you work with homogeneous masonry structures with a ring beam in the right place and slight reinforcement around openings. Simple systems seem to work—and that brings people back to earthen structures. There's a great effort to inform the public of the research results that have been obtained in this field.

John Hurd: Traditional wooden ring beam structures—structures with continuous wooden beams that encircle the walls, which you see from Yugoslavia through Nepal and even in China—behave extraordinarily well in earthquakes. I remember that in Sarajevo there were three- and four-story structures that were undamaged when everything else wasn't. By showing people the houses that didn't collapse, people responded, "well, we've been building Western-style structures for the last 40 years, and these ring beams were expensive, but we didn't know what their function was." So going back to tradition is very useful. These traditional structures behave very well seismically, especially if the building is a regular form—square—as you tend to find in seismic regions.

Neville Agnew: *Is research and development in new earthen construction informing the conservation field with respect to preservation of traditional historic earthen architecture?*

Hugo Houben: We are extraordinarily equipped, from an intellectual point of view, to solve problems for contemporary construction. A lot of research has been done on material characteristics, stabilization, and construction systems. But when you come to the conservation of earthen architecture, very little or nothing of that research can be transferred through to conservation. With new construction, you control everything. With conservation, you go the other way around. You already have the building, and you have to work with the materials that were used.

John Hurd: Currently, the earthen architecture conservation field is teaching more to the new construction field then the other way around. As new construction finds its feet, more information will flow in the opposite direction. But it's flowing the other way at the moment.

Neville Agnew: *In recent decades, the environmental movement has become powerful globally. Do you think that it's had any influence on the acceptance of earth as a building material?*

Hugo Houben: Yes, there is a connection. The idea of biodiversity was brought about by the environmental movement. That seems to have initiated a move toward technodiversity. People are realizing you shouldn't get rid of all kinds of traditional technologies. As soon as you have an economic crisis or whatever, you've lost that traditional knowledge, and you can't produce it anymore. Today we think more in terms of sustainable development. And that's put local material, local resources, local technologies, and constructive cultures into the spotlight.

Tony Crosby: Green architecture is certainly a response to the environmental movement, emphasizing low energy consumption in the production of building materials and low energy requirements for transforming structures into inhabitable environments. And that's where earthen architecture provides a valid solution. Although the impact of the environmental movement on earthen construction may be minimal, any appreciation of the material ultimately helps the conservation field.

John Hurd: Certainly in Europe, earth building technology and self-building are popular among environmentally aware people. You can find your material by fairly low-tech means and build by fairly low-tech means. It gives people an opportunity to build "buildings" rather than "architecture." Although there are architects doing excellent work, there are also many self-builders doing equally excellent things. They are liberated by the material—in its simplicity of use—to do things they normally couldn't do.

Neville Agnew: *What are the two or three most pressing needs in earthen architecture conservation?*

Tony Crosby: I think a greater understanding of how earthen architecture material responds to environmental conditions that result in decay. And related to that, a better understanding of the compatibility of interventions with the existing fabric and building systems. We need more collaboration among all participants in the conservation community: archaeologists, conservation architects, conservators, material scientists, traditional practitioners, and engineers. We have to take greater advantage of what each group can bring to the process. There is also a pressing need for conservation programs that will lead to a better understanding of the issues and of the significance and the historical values of earthen architecture. Hopefully, one result of that would be a standardization of conservation practices.

Hugo Houben: Collaboration between institutions and individuals working in the field: networking. Then there is training, training, training; education, education, education. The other thing we need very much is planning. I used to say that if you're working for the conservation of earthen architecture without planning, you're working against it. So planning is extremely important—and strategic thinking.

John Hurd: Planning, yes. And strategy, yes. Very important. On networking, I'm a private practitioner, so maybe I have a chip on my shoulder, but I'm convinced that there is better communication between institutions than there is between institutions and individual professionals. I'd like to see those barriers broken down. I'd like to see more internationalism. We've all done research in our regions, and we've read about each other's regions. But the amount of cooperation from region to region is not as good as it could be. We've got to break down those barriers—the ones between institutions and practitioners and the ones between regions.

Project Terra

By Erica Avrami

An earthen relief at the 9th- to 15th-century site of Chan Chan in Peru. *Photo:* Erica Avrami.

The wealth of the world's earthen architectural heritage runs the spectrum from entire cities to monumental sites to intricate decorated surfaces. The range and complexity of earthen architectural materials, the variety of sites and environments, and the diversity of possible treatments make conserving this heritage a considerable challenge. Many organizations and individuals are striving to meet this challenge through various field, research, and educational activities.

Since the late 1980s, the International Centre for Earth Construction–School of Architecture of Grenoble (CRAterre-EAG), the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), and the Getty Conservation Institute have collaborated on issues related to earthen architecture conservation. In 1997 they formalized this collaboration with the establishment of Project Terra.

The mission of Project Terra is to foster the development of earthen architecture conservation as a science, a field of study, a professional practice, and a social endeavor. Through cooperative activities in the areas of research, education, planning, and advocacy, the project members seek to advance the field in a variety of ways.

An important aspect of this initiative is its focus on pervasive issues in the field, rather than on the preservation of specific sites. The majority of organizations in the world dealing with conservation are regional, national, or local authorities and nonprofit organizations that are charged with or devoted to the care of heritage resources—collections, buildings, and sites—within their jurisdiction. CRAterre-EAG, ICCROM, and the GCI are all international institutions that do not carry this responsibility. The flexibility afforded by their mandates allows for a broader and more pioneering approach to the needs of the field.

Activities undertaken through Project Terra are designed to advance understanding, policy, and practice in various aspects of earthen architecture conservation, rather than to address site-specific problems or interventions. For example, the January 2001 Shelters Colloquium in Arizona—organized in cooperation with Project Terra—did not focus on the shelter needs of specific earthen sites (see page 27). Rather, it used individual cases as a way to address broader issues related to sheltering and to encourage a more integrated approach to—and evaluation of—shelters for archaeological sites.

As in the case of the Shelters Colloquium, the primary Terra partners—CRAterre-EAG, ICCROM, and the GCI—collaborate with other organizations to undertake particular activities that support both the Terra goals of addressing the broad needs of the field and the often more site—or region—specific goals of associated partners. An example of this collaboration is Project Terra's involvement in the recently completed management plan for the site of Chan Chan in Peru. The Peruvian authorities charged with the long-term care of the 9th- to 15th-century earthen remains of Chan Chan wanted to develop a comprehensive plan for the future of the site, while the Terra partners were interested in promoting integrated planning for earthen heritage resources. By disseminating the methodologies and results of the Chan Chan planning process, Terra hopes to encourage others to develop similar strategies for earthen sites and historic centers. This type of cooperation can also serve to empower local or regional authorities to deal with their conservation issues in a more proactive and integrated way.

Education Efforts

Earthen architecture and its conservation are, on the whole, not well represented in academia. Viewed all too often—and erroneously—as a substandard building material, earth is largely absent from courses on construction technology, design, architectural history, and preservation. Traditionally, the conservation field has responded to this deficiency by organizing short courses related to the preservation of earthen architectural heritage—courses that emphasize the continuity of the tradition of building with earth. The Pan-American Courses on the Conservation and Management of Earthen Architectural and Archaeological Heritage, known as the PAT courses—organized first by CRAterre-EAG and ICCROM in France and then by CRAterre-EAG, ICCROM, the GCI, and the Instituto Nacional de Cultura in Peru—were a series of such short courses, launched in 1989.

PAT99—offered in late 1999 and organized under the auspices of Project Terra—was the last of the short-term, midcareer PAT courses. The 10-year PAT experience trained many professionals, helped connect those working in the field, and provided an

"incubator" for didactic materials and methods in the teaching of earthen architecture conservation.

A primary educational objective of Project Terra is to develop earthen architecture conservation as a field of study at the university level. After the completion of PAT99, the project partners felt that the time was ripe to apply the experiences of PAT to working with institutions of higher learning to establish formal, long-term courses related to earthen architecture and its conservation. The Terra partners are now communicating with interested universities to explore possibilities for collaboration.

That work is being done in conjunction with the UNESCO Chair on Earthen Architecture, Constructive Cultures, and Sustainable Development—an educational program (not a professorship) formally inaugurated in 1998. The UNESCO Chair is based at CRATerre-EAG, which has a long record of university and professional training in the field. In its program, the Chair addresses the need for training from three perspectives: improving conditions of housing constructed with earth, utilizing resources more effectively, and promoting the value of earthen architectural heritage and traditions of building with earth. CRATerre-EAG initiated the work of the Chair by promoting the development of educational programs in new earthen construction—from the housing and resource perspectives—among a growing network of universities and training institutions.

The UNESCO Chair program and the Project Terra partners have launched a joint program called the Terra Consortium. The consortium is conceived as a vehicle for incorporating curricula related to earthen architecture conservation into existing university programs. Specifically, the consortium seeks to promote the development of additional education in the conservation of earthen architectural heritage and earthen building traditions. The Project Terra partners are collectively responsible for identifying institutional partners, coordinating the network/consortium, fostering the development of specific programs, and facilitating the exchange of information and ideas among collaborators. The Terra Consortium aims to develop educational initiatives that embed earthen architecture into existing programs of study dealing with the conservation of the built environment, whether through additional courses, certificates of specialization, postgraduate degrees, or the like. Institutional partners in the consortium will have the opportunity to collaborate with one another, as well as with the Terra partners, in the ongoing evolution of their respective initiatives.

Proposals from interested institutions are being received, and the Terra organizations are evaluating potential collaborations and negotiating with university partners. Through cooperation on the development of curricula, didactic materials, and faculty, the consortium of universities and training institutions addressing the conservation of earthen architecture is expected to grow.

The adobe remains of Ft. Selden *(above, top),* a 19th-century U.S. Army outpost in New Mexico. As part of its involvement in Project Terra, the GCI, in collaboration with the Museum of New Mexico State Monuments, has been evaluating adobe conservation research conducted on specially constructed test walls *(above, bottom)* at the site. *Photos:* Erica Avrami.

Participants in PAT99 in Peru reviewing adobe block tests as part of their six-week course—organized by Project Terra—on the conservation and management of earthen architectural and archaeological heritage. *Photo:* Erica Avrami.

Work in Research

The research component of Terra has also developed over the past couple of years, with a more concentrated effort now under way.

In 1998 a research survey polled scientists and practitioners about perceived research needs in the field and endeavored to identify current research initiatives. The survey was undertaken as a follow-up to the Gaia Research Index, which involved a similar survey in 1992.

In 1999, a review of the research literature began under the auspices of Terra to determine, through the literature, the trends and gaps in earthen architecture conservation research over the past 15 to 20 years. Hubert Guillaud of CRATerre-EAG undertook an initial review, and in the next phase additional colleagues from the field will explore further various themes and topics. This multiphase effort will be compiled and synthesized. The literature review is scheduled for completion before the end of this year.

The Terra partners recognize the challenges posed by the rather limited research base for earthen architecture and its conservation—in particular, research regarding the behavior of earthen materials, components, and structures. Improved understanding of why and how earthen architecture deteriorates would enable the field to make better conservation decisions in the long term and would ultimately help establish the conservation of earthen architecture as a science.

With this in mind, the Terra partners have sought to foster a dialogue among their colleagues about potential areas of investigation. In May 2000—immediately following the Eighth International Conference on the Study and Conservation of Earthen Architecture, held in Torquay, England—Project Terra, in cooperation with English Heritage, hosted a meeting to discuss research needs in the field of earthen architecture conservation (see *Conservation,* vol. 15, no. 2). A summary report of the meeting's discussions and recommendations is available in the Conservation section of the Getty Web site (www.getty.edu/conservation/resources/reports.html).

The priorities and recommendations outlined in the report reflect a process of hypothesizing about the field that, in many instances, extends beyond the traditional boundaries of earthen architecture conservation. This pushing of boundaries requires an ongoing dialogue between those working with earthen architecture and other professionals in related disciplines, in order to define the needs and opportunities for research, as well as to refine specific research questions.

The Project Terra partners are committed to fostering dialogue and to facilitating research collaboration. Some initial steps include:

- As mentioned previously, the Terra partners are coordinating a critical review of research literature related to earthen architecture conservation. The review is expected to be completed in 2001.
- CRATerre-EAG, in collaboration with ICCROM and the GCI, is initiating a dialogue on the development and expansion of existing soil classification systems, used by industry, in order to better meet the needs of earthen architecture conservation.
- CRATerre-EAG, in collaboration with ICCROM and the GCI, is fostering a continued dialogue and potential research collaboration on the binding mechanisms of earthen materials as they relate to earthen architecture conservation. To initiate this effort, a preliminary meeting was held at CRATerre-EAG in early December 2000.
- Ancillary to the initiative on binding mechanisms mentioned above, the GCI, in collaboration with CRATerre-EAG and ICCROM, is initiating cooperative research on the deterioration mechanism of earthen architecture.
- The GCI and the Museum of New Mexico State Monuments are currently undertaking an evaluation of amended mixtures and conservation treatments tested during research efforts at the site of Ft. Selden, New Mexico. The report on phase one of these is available in the Conservation section of the Getty Web site (www.getty.edu/conservation/resources/reports.html).

The above-mentioned initiatives are just some of the activities of Project Terra and represent an even smaller portion of the many endeavors worldwide to protect our earthen architectural heritage and to promote continuity of the tradition of building with earth. The overall development of the field of earthen architecture conservation is an ongoing pursuit on the part of many. The Project Terra partners are hopeful that by leveraging their own institutional resources—and by collaborating with additional organizations and individuals—they can significantly contribute to the growing interest in earthen architecture and the increasing efforts to protect this heritage found throughout the world.

Erica Avrami, GCI project specialist, serves as the Institute's project manager for Project Terra.

For more information about Project Terra and for links to the CRATerre-EAG and ICCROM partner sites, please visit:

Project Terra
www.getty.edu/conservation/activities/terra/

Joya de Cerén

Conservation and Management Planning for an Earthen Archaeological Site

By Carolina Castellanos, Françoise Descamps, and María Isaura Aráuz

The excavation of Structure 3 at Joya de Cerén in 1989. *Photo:* Payson Sheets.

The World Heritage Site of Joya de Cerén in El Salvador is an exceptional window into the past. Buried by a volcanic eruption in the sixth century, the earthen architectural remains and the artifacts of this Classic Period village have been remarkably preserved. Perhaps no other place so well illustrates the continuity of ways of life. Many of the features that characterize small agricultural communities in Central America today can be found at Joya de Cerén, frozen in time—from the cookware to the plants and fibers. This site, linking the past with the present, has become a symbol of identity for the local population and for El Salvador in general.

The discovery of Joya de Cerén in 1979 and the subsequent archaeological investigation have provided unique information regarding the development and cultural history of small settlements at the southern periphery of Mesoamerica during the Classic Period, advancing considerably our understanding of the daily lives of the pre-Hispanic inhabitants.

For the field of earthen architecture, Joya de Cerén is significant because earthen architecture this old is rarely found in wet tropical climates. The structures' outstanding degree of preservation allows us to study in depth architectural systems, construction techniques, and materials, expanding our knowledge of earthen materials in this environment.

Of the 18 known structures at Joya de Cerén, 10 have been completely excavated. Surveys indicate the existence of other structures, which suggests that this was a thriving settlement within the Zapotitan Valley.

The exposed excavated earthen structures present a conservation challenge. From the onset, conservation was attempted through a variety of interventions, ranging from structural stabilization and surface consolidation to the building of massive protective shelters over the exposed areas and the installation of drainage systems.

In spite of these measures and continuous maintenance, the site's structures continue to deteriorate, a consequence both of mechanisms inherent to the nature and composition of the building materials and techniques and of conditions created by the wet tropical climate. Wind, earthquakes, hurricanes, and extreme variations in temperature and humidity continue to constitute a threat. The conditions created by the protective shelters remain to be evaluated both with regard to their limitations in mitigating decay and to their possible improvement in design. The most damaging factor may be the mechanical and chemical effects of water, which produces erosion, promotes the transfer of salts, generates conditions for microbiological growth, and ultimately leads to the detachment, disintegration, and loss of materials.

But the threats are not limited to environmental factors or intrinsic material decay. One of the most important threats is human development, both on and off the site. Surrounding industrial development, suburban expansion, and dramatic changes in the agricultural landscape affect the conservation of the structures and the public's perception and appreciation of the site.

A Management Plan

In 1998, within the framework of its Maya Initiative, the Getty Conservation Institute began a collaborative project at Joya de Cerén with Concultura, El Salvador's primary governmental agency for the conservation of cultural heritage. The project seeks to apply a method developed by the GCI to create management plans that can ensure the conservation of sites. This method is being adapted to prepare a specific plan for Joya de Cerén that can serve as a model for other sites in the region. Since issues raised by the conservation of earthen materials in a wet tropical climate must be addressed in the management of the site, scientific research and condition monitoring were also proposed to gain a better understanding of deterioration mechanisms and to further develop plans to mitigate their impact.

The preparation of the management plan is being conducted by a multidisciplinary team as a collaborative endeavor between Concultura and the GCI. The planning initiative for Joya de Cerén

is based on an approach that takes into consideration the site's cultural significance and addresses not only the conservation needs of the structures but also issues related to the natural setting and the social context.

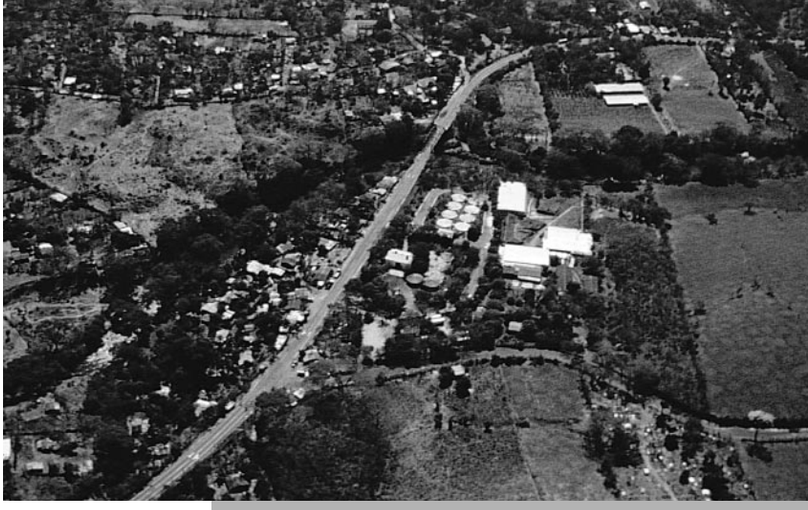
The planning process is composed of three major phases: (1) investigation, (2) analysis and response (which includes broad understanding of the site and its context, analysis of conditions, assessment of cultural significance, definition of policies, and a future vision for the site), and (3) the development of programs and specific projects. The process also outlines an implementation program and defines guidelines for the evaluation and revision of the plan.

Since the development of proposals that will best preserve Joya de Cerén requires a precise understanding of the site and its context, a large part of the project has centered on assessment. This has included extensive documentation—from topographic surveys to architectural drawings for condition recording; the compilation of written documentation and information from other government and nonprofit agencies; interviews and polls; and other efforts to evaluate the social and natural needs of the area surrounding the site.

The specific conditions of Joya de Cerén (an earthen site in a wet tropical climate) dictate considerable research, ranging from the recording of deterioration during different seasons to material analysis and environmental monitoring. Because conservation of the site's structures is directly related to the environmental conditions still being analyzed, the construction of new elements for presentation of the site remains, for the moment, limited to small improvements of the protection systems. Systematic investigation is the only way to acquire the essential data needed to guide effective and long-term interventions—for the structures themselves, as well as the protective shelters and drainage systems.

Conservation measures also have to be reconciled with the values of the place and the needs of groups with interests in the site. Joya de Cerén is significant in many respects, including enhancing our understanding of the region's past, which can foster appropriate agricultural practice and earthen architecture in the present. But there are also economic expectations surrounding the site. Local communities hope that Joya de Cerén will generate economic benefits through tourism and scientific activities. The tourism sector—which expects to boost activities in El Salvador through increased visitation to the site—would like better facilities and more areas open to the public.

Ultimately, the conservation of the site cannot succeed in the long term unless it contributes in some way to improvements for surrounding communities. The restrictions imposed by appropriate conservation need to be reconciled with the expectations of each group, and a consensus needs to be reached on priorities and on a



Above, top: **An aerial view of the site showing the adjacent road, the river, and the development of suburban settlements. The excavated structures are under the large white roofs in the right central portion of the photograph.** ***Photo:*** **Irene Sen.**

Above, bottom: **Representatives of a number of groups with interest in Joya de Cerén meeting in El Salvador in August 2000 to discuss the cultural significance assessment of the site.** ***Photo:*** **Françoise Descamps.**

El Salvador Earthquake Relief

In January 2001, a strong earthquake hit El Salvador, causing hundreds of deaths and damage to buildings of all types. Especially hard hit were the historic town centers where traditional earthen architecture predominates. Only one month later, a second destructive earthquake resulted in additional deaths and heavy damage to buildings already weakened by the first tremor.

Early in March, Getty Conservation Institute staff met with El Salvador's National Council for Culture and Art, Concultura, and toured a number of the damaged historic towns. The Institute has established a strong working relationship with Concultura, its partner for the past three years at Joya de Cerén, and the GCI's earthquake assistance in El Salvador will be carried out jointly with the council. The GCI is coordinating its relief efforts with those of other international agencies charged with protecting cultural heritage, including US/ICOMOS.

Structure 12 at Joya de Cerén. Past interventions, including attempts at consolidation, can be seen. *Photo:* Irene Sen.

Structure 4 at the site. The earthen wall displays the effects of rising water—among them, the development of microgrowth, disintegration, cracking, and detachment. *Photo:* Urs Muller.

vision for the future. Consequently, the planning process at Joya de Cerén had to be a participatory one that included stakeholders along with the multidisciplinary project team.

Collective Decision Making

In practice, planning at Joya de Cerén includes the participation of a wide range of interest groups. Different interests in the site have been discussed and considered and a number of different ideas for the site reconciled.

This participatory process included a large meeting in August 2000 to conclude the assessment phase. The purpose of gathering together representatives of different groups was to undertake jointly the cultural significance assessment and to evaluate the conditions and conservation challenges faced by the earthen site, in order to define options that would not compromise the site's conservation.

Based on interests identified during the documentation and investigation phases, the meeting was structured around seven issues: investigation and conservation, education, tourism, social environment, risk preparedness, territorial and social development, and legislative and administrative issues. Each issue was discussed by working groups, which included conservation professionals and representatives of the various interest groups—the adjacent communities, the municipality of San Salvador, environmental institutions, infrastructure and housing organizations, and industry.

During the discussions of the site's significance, participants acknowledged how much Joya de Cerén contributes to El Salvador's cultural identity and its sense of the past. They discussed the best ways to build upon the site's historic and scientific importance, as well as how to foster appropriate socioeconomic development through the site.

One of the most controversial issues debated was the continuation of excavations at the site—not only for scientific purposes but also for opening more of the site to the public. In the end, the group agreed that archaeological research could continue but that it should not, for the moment, include extensive excavations; these could resume once better conservation conditions were achieved. The group also agreed that visitor needs could be addressed by enhancing existing excavated areas, as well as by improving presentation of the site.

Along with the progress made on the condition assessment of the site, the conclusions of these intense working sessions provided the basis for development of the management plan proposal. Similarly, this work began the construction of a collective vision of the site's future, which will help create policies consistent with the site's conservation requirements. The management plan now being developed encompasses the conservation of the natural and cultural heritage in a manner that contributes to sustainable development. The involvement of participants with diverse interests has allowed for a reconciliation of many of the ideas for the site and the surrounding area (particularly those regarding tourism and industrial development). It has also fostered greater awareness of the site's significance and its national importance—an awareness that is essential for the successful and ongoing conservation of Joya de Cerén. Planning jointly for the future management of the site has produced a larger sense of responsibility and commitment to conservation, on both the institutional and the personal level. In addition, there is greater participation now from Concultura in initiatives undertaken by other agencies, including the economic development for the Zapotitan Valley and projects for tourism development on the national level.

The implementation of the final management plan will rest not only on Concultura. The local communities and the municipality of San Juan Opico have established a continuing dialogue to facilitate the preservation of the site, and policies have been established that define the roles and responsibilities of different groups. It is hoped that this process of participation will contribute to the conservation of this unique site in a manner that is responsive to the social, political, and economic needs of the community.

Carolina Castellanos is an archaeological conservator and a consultant to the GCI. Françoise Descamps is a GCI senior project specialist. María Isaura Aráuz is director of the Dirección Nacional de Patrimonio Cultural at Concultura.

Project Updates

Mogao Grottoes

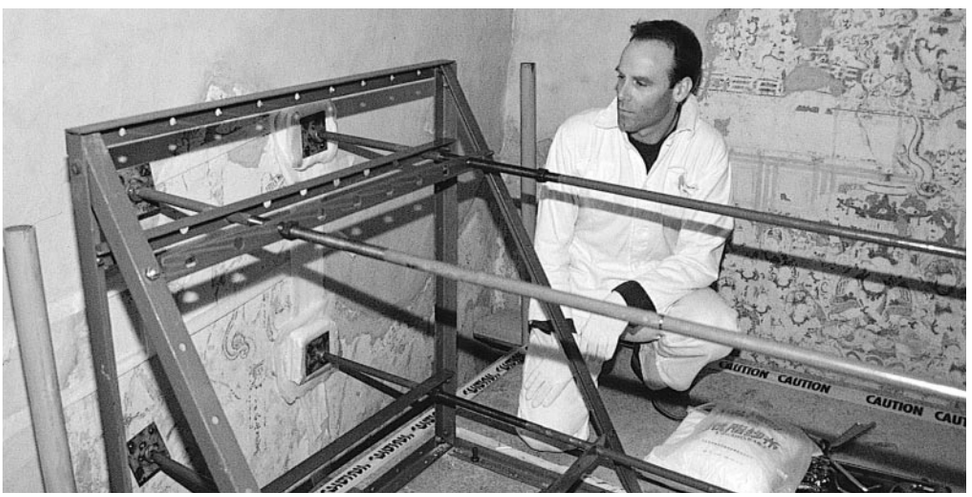
In September and October 2000, a Getty Conservation Institute team continued its collaboration with the Dunhuang Academy at the Mogao grottoes in China on a wall paintings conservation model project.

Cave 85, the large Tang dynasty cave temple at the site, is the focus of the project. Thus far, work has included intensive diagnostic study of the active deterioration processes affecting the wall paintings.

During the five-week field campaign last fall, the project team completed emergency treatment procedures—microgrouting and the re-adhering of paint flakes with water and Japanese tissue paper. Laboratory-based grouting tests were completed, and three grout mixtures were selected for final testing and in situ trials. New edge repairs were made around the bases of walls, and original plaster and painting were recovered from beneath previous repairs. The vulnerable areas of plaster detachment were protected by installation of frames and presses that will also be used during grouting of these areas.

The emphasis of the intervention is not so much on new treatment materials and techniques—although significant advances are being made in some fresh areas—but on assisting the Dunhuang Academy to refine a conservation approach that stresses minimal intervention, use of compatible materials, and a methodology that seeks to minimize the unwanted side effects that have hampered past interventions at Mogao.

As in previous campaigns, wall paintings conservators and site managers from Dunhuang and other Silk Road sites participated in the work.



During the field campaign at Mogao, presses were installed on a temporary basis to hold in place fragile areas of detached plaster. The presses will also help during the injection of adhesive grouting by providing gentle pressure to re-adhere the plaster. *Photo:* Francesca Piqué.

Meeting at Copán

In September 2000 at the Maya site of Copán in Honduras, the Getty Conservation Institute gathered experts from a variety of fields to analyze the condition of the extraordinary hieroglyphic stairway on the site, to develop a plan for further research, and to make preliminary recommendations for the stairway's conservation. The GCI is working with the Instituto Hondureño de Antropología e Historia (IHAH) on developing the conservation plan for the eighth-century stairway, which records two centuries of dynastic rule at Copán.

The September meeting followed a photographic survey of the stairway, conducted in June and July. A condition survey of the stairway, which began in the summer of 2000, is still under way. The purpose of the survey is to gather the precise data required to provide a condition evaluation, to create a basis for site monitoring, and to guide an intervention strategy.

The objectives of the meeting included discussing the probable causes of decay of the stairway; defining a strategy for further scientific analysis of materials, decay products, and microbiological and plant growth; and discussing potential conservation solutions and options for presentation of the stairway.

The work at Copán is part of the GCI's Maya Initiative, which focuses on advancing regional conservation practice and collaboration among the countries of the area.

Values and Economics Meeting

Three years ago, the GCI undertook its Values and Economics Project to provide tools and methods to conservators and allied professionals for assessing values—cultural and economic—and for applying the results of such assessments to guide sustainable conservation and management solutions.

In February 2001, a two-day meeting was held at the Getty Center to discuss the next phase of the project. This phase involves compiling and examining past experiences and existing approaches in conservation planning through the development of analytical case histories of heritage planning. These case studies would complement the more theoretical research that has been done to date, providing professionals with a set of references for the assessment of values in their work.

At the February meeting, representatives of the Australian Heritage Commission, English Heritage, Parks Canada, the U.S. National Park Service, and the GCI reviewed their respective approaches to heritage planning and identified ways in which their experiences might be analyzed and disseminated. The specific aims of the meeting were to discuss the potential for institutional collaboration, to identify possible projects as case study subjects, to suggest additional working group members, and to set out a preliminary framework for the development of the work.

It is anticipated that a working group of organization representatives will be established to identify cases, finalize the framework for their development, and exchange information as cases develop. The direct outcome of this effort will be publication of a series of cases analyzing how values were assessed, how the significance of a site was established, and the influence of the significance on conservation and management policies and plan implementation.

Meeting on Inorganic Consolidants

A meeting cosponsored by the Getty Conservation Institute and English Heritage was held December 7–8, 2000, in London to discuss inorganic consolidants and related techniques—specifically, lime water, barium hydroxide, and artificial oxalates.

The meeting's objectives were to identify outstanding questions related to these materials and their applications and to develop proposals for future research and collaboration. Recent developments in the use of tartrate conversion coatings and biomineralization techniques were also considered. An international group of conservators and conservation scientists was invited to participate, including representatives from English Heritage, the Institute of Archaeology of University College London, the National Museums and Galleries on Merseyside in the United Kingdom, the Opificio delle Pietre Dure in Florence, Columbia University in New York, and the University of Granada in Spain.

The meeting was held as part of a feasibility study developed at the GCI to investigate the state of knowledge and the need for research regarding inorganic consolidants and their use.

Meeting Participants

Eric Doehne
Scientist
Getty Conservation Institute

John Fidler
Head, Building Conservation and Research
English Heritage

Eric Hansen
Scientist
Getty Conservation Institute

John Larson
Conservator
Conservation Center, National Museums and Galleries on Merseyside

Eleni Loizides
Building Conservation and Research Team
English Heritage

William Martin
Senior Architectural Conservator
English Heritage

Mauro Matteini
Head, Scientific Laboratories
Opificio delle Pietre Dure

Carlos Rodriguez Navarro
Associate Professor, Department of Mineralogy and Petrography
University of Granada

Eduardo Sebastian Pardo
Professor, Department of Mineralogy and Petrography
University of Granada

Clifford Price
Reader in Archaeological Conservation
Institute of Archaeology, University College London

Alberto de Tagle
Chief Scientist
Getty Conservation Institute

Jeanne Marie Teutonico
Associate Director
Getty Conservation Institute

Norman Weiss
Adjunct Associate Professor
Graduate School of Architecture, Planning, and Preservation, Columbia University

Colloquium on Protective Shelters

A colloquium entitled "Protective Shelters for Archaeological Sites in the Southwest" was held in Tumacacori, Arizona, from January 9 through 12, 2001. The event was organized by the US/ICOMOS Specialized Committee on Earthen Architecture, in cooperation with the U.S. National Park Service, the Museum of New Mexico State Monuments, and the Getty Conservation Institute (under the auspices of Project Terra). Partial funding was provided by a grant from the National Center for Preservation Technology and Training of the U.S. National Park Service.

The three-day meeting—focused on protective shelters for archaeological sites—explored four major themes: (1) deciding to shelter; (2) establishing conservation, design, and construction criteria; (3) designing and constructing shelters; and, (4) evaluating shelter performance. These topics provided a methodological framework for a discussion of the issues and decision making involved in sheltering, among the nearly 40 architects, archaeologists, conservators, and other professionals who participated in the colloquium.

Through various presentations and case studies, participants debated the positive and negative aspects of protective shelters, as well as the effects shelters have on the values of a site. In addition, field visits to the Tumacacori National Historical Park and the Casa Grande Ruins National Monument, as well as an optional trip to

the Cocospera Mission archaeological site in Mexico, provided opportunities to view and analyze sites where shelters have been erected or proposed.

Recommendations for advancing the field of knowledge regarding shelters were outlined by the participants at the conclusion of the colloquium. These recommendations, along with selected papers from the colloquium, will be published in an upcoming, special edition of the journal *Conservation and Management of Archaeological Sites.*

Colloquium participants visiting Casa Grande Ruins National Monument in Arizona. The earthen structure beneath the shelter dates from the 14th century. The shelter, erected in 1932, was designed by Frederick Law Olmsted Jr. *Photo:* Erica Avrami.

Colloquium Speakers, Coordinators, and Moderators

Neville Agnew
Principal Project Specialist
Getty Conservation Institute

Zaki Aslan
Head, Petra Stone Conservation Project
Department of Antiquities, Jordan

Erica Avrami
Project Specialist
Getty Conservation Institute

Jake Barrow
Senior Exhibit Specialist
U.S. National Park Service Intermountain Support Office, New Mexico

Kaisa Barthuli
Archaeology Technician
U.S. National Park Service Intermountain Support Office, New Mexico

Carolina Castellanos
Archaeological Conservator
Mexico

Martha Demas
Senior Project Specialist
Getty Conservation Institute

John Fidler
Head, Building Conservation and Research
English Heritage, United Kingdom

Kathy Fiero
Archaeologist
Mesa Verde National Park, Colorado

James W. Garrison
State Historic Preservation Officer
Chief of the Historic Preservation Section, Arizona State Parks

Pamela Jerome
Architectural Conservator, Senior Associate
Preservation Department, Wank Adams Slavin Associates, New York

Frank Matero
Director, Graduate Program in Historic Preservation
University of Pennsylvania

John Montgomery
Professor of Anthropology
Eastern New Mexico University

Gaetano Palumbo
Senior Lecturer in Archaeology and Heritage Studies, Institute of Archaeology
University College London, United Kingdom

Ann Rasor
Superintendent
Tumacacori National Historical Park, Arizona

Jeff Rust
Archaeologist
Fort Davis National Historical Site, Texas

Nicholas Stanley-Price
Director
ICCROM, Italy

Mike Taylor
Archaeologist and Deputy Director
Museum of New Mexico State Monuments

Jeanne Marie Teutonico
Associate Director
Getty Conservation Institute

Troy Thompson
Associate and Studio Director
Schmidt Associates, Indiana

Dave Yubeta
Tumacacori National Historical Park, Arizona

Czech Engineering Award

On November 30, 2000, the Engineering Academy of the Czech Republic presented its Engineering Academy Prize 2000 to the project team responsible for the restoration and conservation of *The Last Judgment* mosaic on St. Vitus Cathedral in Prague Castle. The restoration and conservation of the 14th-century glass mosaic was a joint project of the Czech government and the Getty Conservation Institute.

The recipients of the award included Eliska Fucíková of the Office of the President of the Czech Republic; Dusan Stulik and Francesca Piqué of the Getty Conservation Institute; John Mackenzie and Eric Bescher of the Department of Material Science and Engineering, University of California, Los Angeles (UCLA); the Prague Castle Administration; and the conservation team for the mosaic.

The Engineering Academy Prize is awarded annually "to Czech or foreign individuals or teams in recognition of their outstanding work in the field of engineering and for their contributions to the development of engineering research in the Czech Republic." This is the first time that the award has been given to the art conservation field.

In awarding the prize to *The Last Judgment* mosaic team, the Engineering Academy specifically recognized the team's use of sol-gel technology, a polymer coating originally used by the aerospace and medical industries and adapted by the team to create a multilayer protective coating for the mosaic. This was the first use of the high-tech coating for art conservation purposes. The multilayer coating approach was developed by the GCI, working with UCLA's Department of Material Science and Engineering.

The GCI and the Office of the President of the Czech Republic began collaborating on the conservation of *The Last Judgment* mosaic in 1992. Located on the south entrance to St. Vitus Cathedral—known as the Golden Gate—*The Last Judgment* is considered the most significant exterior monumental medieval mosaic north of the Alps. A symposium on the project will be held in Prague in June 2001.

Petr Zuna, president of the Czech Engineering Academy, presenting the Engineering Academy Prize 2000 to Eliska Fucíková of the Office of the President of the Czech Republic; John Mackenzie of the Department of Material Science and Engineering, UCLA; and Dusan Stulik of the GCI. *Photo:* Courtesy the Engineering Academy of the Czech Republic.

Graphic Documentation of Mural Paintings

The proceedings of the seminar GRADOC: Graphic Documentation Systems in Conservation of Mural Paintings—held at and organized by ICCROM in Rome in November 1999—have been published by ICCROM (www.iccrom.org/eng/index.htm).

At this international seminar—which the Getty Conservation Institute assisted in planning—26 specialists in the field of conservation documentation addressed the purpose and the methodology for the documentation of wall paintings, as well as the advantages and challenges of using rapidly evolving digital technology. The proceedings publication provides a comprehensive overview of the current status of knowledge in this field.

The seminar was designed as a forum for a productive interchange of ideas. The participants, from 16 countries, shared research findings and practical experience, attempted to define the basic principles for the graphic documentation of mural paintings and related architectural surfaces, and evaluated recent applications, including computer-aided systems.

Presentations were organized in two groups of topics. The first addressed the aims, methods, and standards of graphic documentation, while the second focused on the critical evaluation of digital graphic documentation and databases. In addition to attending the presentations, participants divided into working groups to develop recommendations about documentation.

Papers from both groups of topics and the results of the working group sessions are included in the publication. The publication also includes a glossary of terms related to conservation documentation and a transcript of the discussion that followed the presentations.

At the seminar, GCI staff members Francesca Piqué and Gaetano Palumbo presented the protocol of graphic condition recording used in GCI field projects and the spatial database developed for the conservation of the Siqueiros mural *América Tropical,* in Los Angeles. They also chaired several seminar sessions and later participated as members of the editing committee of the book.

Support for the seminar and the proceedings publication was provided by the GCI, English Heritage, and the European Union Raphael Program. Other partner institutions included: the Istituto Centrale per il Restauro, Italy; the Wall Painting Conservation Department of the Courtauld Institute of Art, United Kingdom; the Institut Royal du Patrimoine Artistique, Belgium; the Niedersachsen Landesamt für Denkmalpflege, Germany; the Comité International de Photogrammétrie Architecturale, Canada; and the Consiglio Nazionale delle Richerche, Italy.

New Getty Web Site Launched

In February the Getty launched its new Web site, designed to enhance public access to the Getty's resources.

In the redesigned site, the Web content of the Getty Conservation Institute is now part of the conservation area of the site. This area is divided into three main sections: How we work, Activities, and Resources.

The "How we work" section describes the nature of the GCI's work in the lab, in education, and out in the field. The "Activities" section contains descriptions of current and past projects of the Institute. The "Resources" section includes links to electronic editions of *Conservation, The GCI Newsletter;* information on *Art and Archaeology Technical Abstracts (AATA)* and the GCI Information Center; and access to free electronic publications of the Institute.

The new site significantly increases the amount of information now available electronically regarding the GCI and its work. The site also contains information regarding the conservation work of the J. Paul Getty Museum.

Please read about the conservation work of the Getty in the Conservation section of www.getty.edu .

Catherine Fritz

Budget Analyst, Administration

Dennis Keeley

Christopher Gray

Senior Project Specialist, Field Projects

Dennis Keeley

For over eight years, Catherine Fritz has served with GCI Administration. Her current responsibilities include coordinating and preparing the Institute's annual budget, reviewing department budgets on a monthly basis, and assisting in human resources matters. She also approves the GCI's accounting, expense report, and staff travel activities.

Catherine was raised in Arlington, a suburb of Ft. Worth, Texas. Early on, music was a part of her life. She began to play the piano at five and to learn the violin in fourth grade, playing competitively beyond college. Her father worked as a systems engineer for a defense company, and her mother taught Spanish at a local high school. Although her mother was one of her high school teachers, Catherine's real interest in Spanish developed when she went off to Trinity University in San Antonio. She majored in foreign languages (Spanish and Portuguese) and spent her junior year abroad in Madrid. At the urging of her father, she completed a minor in business. At the time, she thought that she'd never make use of her business studies.

Following graduation, she moved to Dallas, working first for a small import-export company and then for a bank. In 1987 she enrolled at the American Graduate School of International Management in Phoenix, where she earned a master's degree. A summer internship at a brokerage house in Mexico City solidified her command of Spanish.

After a brief stint with a travel firm in Dallas, she moved to Los Angeles to become an auditor with Occidental Petroleum. She spent over three-quarters of her time away from the home office, conducting operational and financial audits of the company's subsidiaries, including some in Mexico and Brazil, where she continually used her Spanish and Portuguese. After one assignment at a beef slaughterhouse in Idaho, she became a vegetarian for six months.

In 1993 Catherine came to work at the GCI after learning of an administrative position at the Institute through a former colleague from Occidental. Today, in addition to her budget-related responsibilities, she serves on a number of Getty-wide committees and administers the Institute's internship program.

Even though travel is no longer a part of her work, her love of visiting new places remains, and several times a year, she is off to locales that offer her the chance to engage in scuba diving and sightseeing, longtime interests.

The focus of Christopher Gray's current work is the development of a formal documentation strategy that can be integrated into the management of field projects, including the use of electronic documentation. He recently managed the GCI's survey of the Maya stairway at Copán in Honduras.

Chris was born and raised in Brighton, in Sussex, England. His father worked as an engineer for the national telephone company, and his mother was an administrator in a national trade union. At 18 he went off to college at the University of East London to study surveying. While there, he channeled his interest in music into organizing concerts for the university, booking such acts as Pink Floyd, Deep Purple, Country Joe and the Fish, and Taj Mahal.

Following college, Chris worked for a major architectural practice in London. This led to a position as a surveyor with Esso Petroleum a year later. After several years with Esso, he took time off to travel in the United States, seeing the country from coast to coast. Returning to England in 1974, he started his career in conservation by being hired as a freelance field surveyor by the national Department of Ancient Monuments and Historic Buildings, later becoming part of the department's staff. He documented sites all over England, including Stonehenge, the Tower of London, Hampton Court, and abbeys in Yorkshire, marveling that he was being paid to work in some of England's most beautiful places. Between 1979 and 1985, Chris also worked periodically and independently in Egypt, surveying archaeological sites in Abydos and Luxor for American university excavation teams and providing training for local Egyptians.

In the mid-1980s, Chris's organization became English Heritage, and he took on a new role as survey manager, overseeing the major work that was outsourced to the private sector. In that capacity, he managed large-scale surveys of places such as Hadrian's Wall and many of the important Neolithic and abbey sites. He left English Heritage in 1992 to become a consultant; his major client was CADW, the governmental agency responsible for conservation in Wales.

In 1996 he joined the GCI as deputy director of the Documentation program. When the Institute was reorganized two years later, Chris became a senior project specialist in Field Projects. In addition to his documentation work, he has, for several years, organized Getty internal and public lectures on conservation.