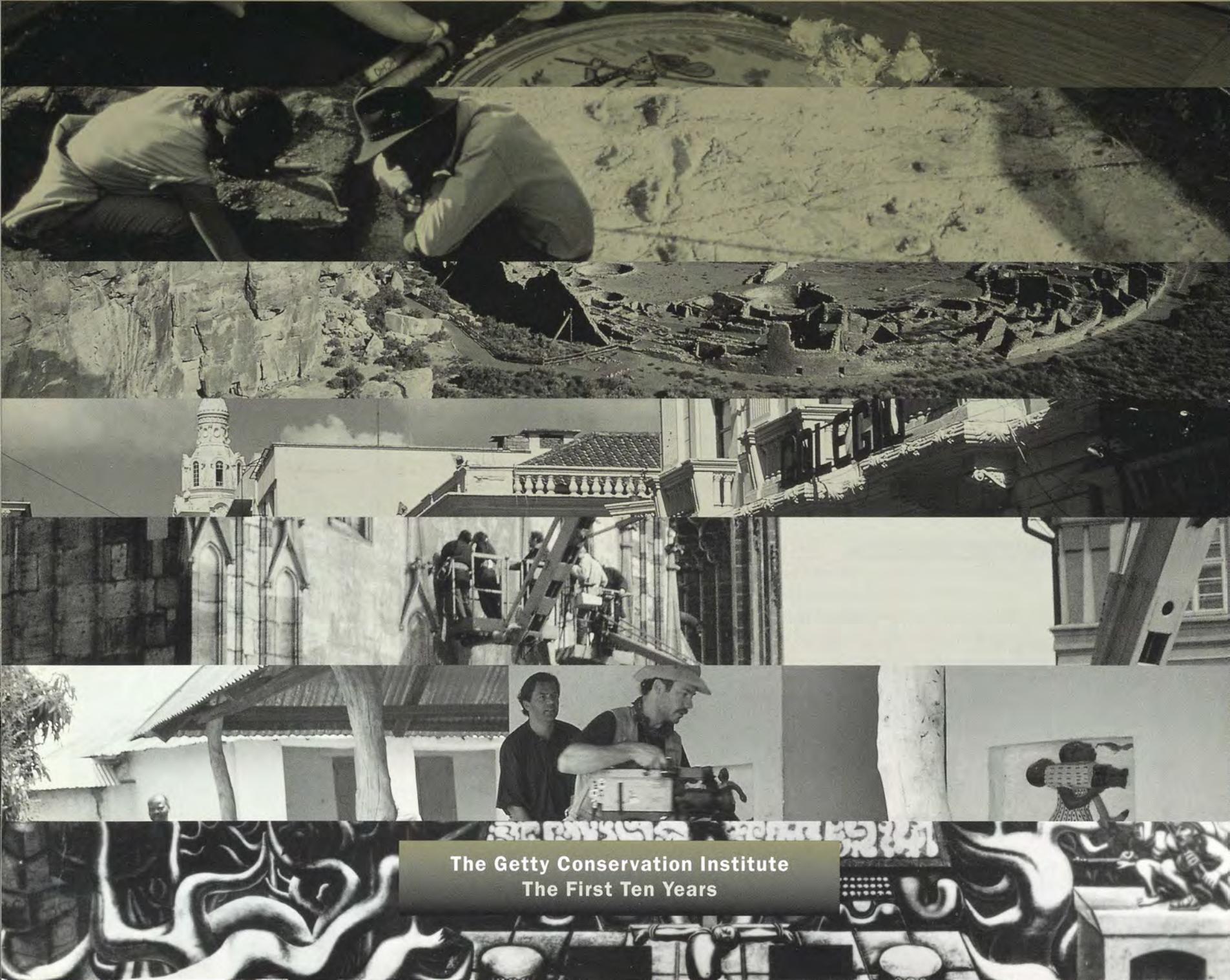


CONSERVATION

The GCI Newsletter



The Getty Conservation Institute
The First Ten Years

The Getty Conservation Institute Newsletter

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The Getty Conservation Institute

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The Getty Conservation Institute

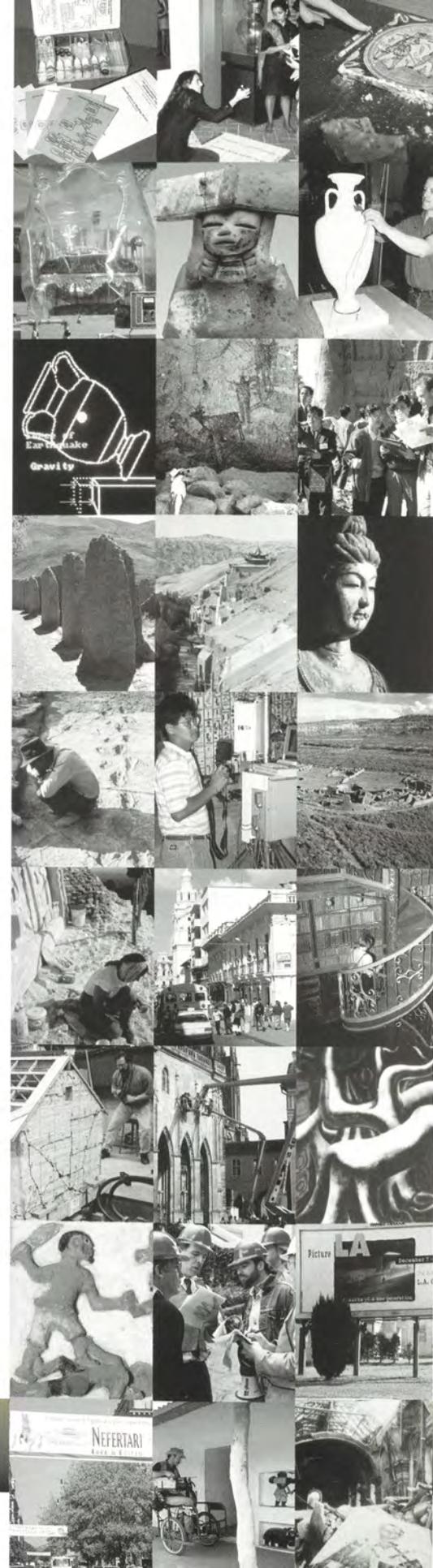
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Front cover:

Images from the work of the Getty Conservation Institute during its first 10 years.

Back cover:

Globe photo by Dennis Keeley.



Contents

Introduction

5 A Note from the Editor

This is the second of two special issues of *Conservation* that mark the tenth anniversary of the Getty Conservation Institute. The Editor of the Newsletter, Jeffrey Levin, introduces this issue, which examines highlights of the Institute's work in four categories—objects and collections, archaeological sites and monuments, historic structures and cities, and public awareness and advocacy.

Features

6 Objects & Collections

Research and training in conservation of objects and collections have been a focus of the GCI from the Institute's earliest days. Work has ranged from specific problems of treatment—such as the conservation of painted ethnographic objects—to the all-encompassing issues of the museum environment and preventive conservation. In studying and developing solutions to the conservation problems of objects and collections, the GCI has sought practical applications and disseminated them through training courses and publications.

12 Archaeological Sites & Monuments

Archaeological sites and ancient monuments allow us to look back in time to discern how cultures and civilizations lived. But our archaeological store of sites is finite and nonrenewable, a diminishing resource under threat from development, industrialization, catastrophes, excavation, mass tourism, and looting. In courses, at conferences, and in the field, the GCI has promoted comprehensive site management that draws upon multidisciplinary expertise and seeks to incorporate the needs of all who have an interest in a site.

20 Historic Structures & Cities

The places where people live are often interlaced with elements of cultural heritage—from the entire core of a historic city to a single structure or a work of art in the midst of living spaces that defines those spaces and forms a component of their history. While this proximity to people gives historic structures and cities life, it can simultaneously threaten their preservation. In several projects, the GCI has worked to address the conservation challenges of preserving architectural and artistic heritage in inhabited places.

26 Public Awareness & Advocacy

In our communications-centered age, it is difficult to imagine a collective endeavor that can thrive without the tools of communication. Conservation is no exception. Early on, working to increase conservation knowledge and awareness was an important part of the GCI's mission. The Institute's initial efforts were directed toward the conservation professional. More recently, it has expanded its communication activities to reach out to the general public.

Profile

32 Preserving Cultural Heritage in the Information Age: A Conversation with Miguel Angel Corzo

GCI Director Miguel Angel Corzo reflects on the justification for preservation efforts and discusses the important role information plays both in advancing conservation knowledge and in helping the public make informed choices about what we value and what of our cultural heritage we must preserve.

Volume X Number III

A Special Issue of *Conservation*

Vancouver, Canada

*Ottawa, Canada
Kingston, Canada*

Chicago, U.S.A.

Painted Rock, U.S.A.

Bryn Mawr, U.S.A.

San Buenaventura, U.S.A.

Winterthur, U.S.A.

Los Angeles, U.S.A. Chaco Canyon, U.S.A.

Washington, D.C., U.S.A.

Las Cruces, U.S.A.

Tucson, U.S.A.

New Orleans, U.S.A.

Sierra de San Francisco, Mexico

Honolulu, U.S.A.

Mexico City, Mexico

San Ignacio, Belize

Puebla, Mexico

Xumantunich, Belize

Oaxaca, Mexico

San Cristóbal de las Casas, Mexico

Cartagena, Colombia

Quito, Ecuador

Tiwanaku, Bolivia

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Skopje, Former Yugoslav Republic of Macedonia

Valltorta, Spain

Rome, Italy Salonika, Greece

Barcelona, Spain

Paphos, Cyprus

Madrid, Spain Ibiza, Spain

Cairo, Egypt

Jerusalem, Israel

Tunis, Tunisia

Luxor, Egypt

Abomey, Benin

Laetoli, Tanzania

Cape Town, South Africa

THE GETTY CONSERVATION INSTITUTE AROUND THE WORLD

Sites of GCI projects, conferences, and courses

A NOTE FROM THE

E d i t o r

Dunhuang, People's Republic of China

Datong, People's Republic of China

Tokyo, Japan

New Delhi, India

Bombay, India

Chiang Mai, Thailand

Colombo, Sri Lanka

Canberra, Australia

Melbourne, Australia

In the previous issue of *Conservation, The GCI Newsletter*, we commemorated this tenth anniversary of the Getty Conservation Institute by taking a general retrospective look at the Institute's growth and development.

In this issue of *Conservation*, we examine some specific, selected highlights of the Institute's work in the four categories that encompass the GCI's efforts—objects and collections, archaeological sites and monuments, historic structures and cities, and public awareness and advocacy. These selections are not intended to provide a comprehensive view of the Institute's work but rather to offer a glimpse of the variety of endeavors undertaken by the staff.

The work described here reflects the range of the Institute's activities—from research on pollutants in museums and seismic mitigation measures for objects, to courses on conservation for archaeologists and the development of environmental monitoring stations. The scope of the Institute's work is equally broad, encompassing California colonial adobes, bas-reliefs in Benin, Chinese Buddhist shrines, and a historic city in Ecuador.

Because what can be defined as cultural heritage is broad and diverse, so too must be the efforts to preserve and protect it. In the next ten years, those who labor directly on conservation's behalf will be increasingly dependent on public awareness, for only with broad public support will the resources be available to preserve our wealth of heritage. One of the great challenges for the conservation profession in the years ahead is acquiring the skills of advocacy in the pursuit of its mandate. Creating a larger constituency for its work in ways that educate and excite is critical, if even a portion of what has been left to us is to survive.

Ultimately the preservation of cultural heritage is the responsibility of all of us—for we all draw inspiration, understanding, and a sense of identity from its presence. This heritage constitutes a series of landmarks in the evolution of civilization, and its loss obscures the road humanity has traveled through time. It is important to us—and to those who follow us—that the path our cultural heritage represents remain forever in view.

It is our collective memory that is at stake.

Jeffrey Levin

Editor

Conservation, The GCI Newsletter

Objects & Collections

MUCH OF WHAT WE CALL CULTURAL HERITAGE falls into the category of objects and collections. For that reason, the conservation of objects and collections has been a focus of GCI research and training from the Institute's earliest days.

Traditionally found in museums, the artifacts and works of art that compose collections are often referred to as *movable cultural property* because they have been removed from their original context—as opposed to *immovable cultural property* such as archaeological sites and historic structures. In some instances, collections of movable cultural property concentrate on a particular type of object or highlight a diversity of cultures and time periods. In either case, they provide an important perspective on humanity's cultural development. Collections contain works of art such as paintings, drawings, and sculpture; functional objects including ethnographic materials and everyday household items; or natural history samples ranging from birds and mammals to botanical and geological specimens. They typically encompass a wide spectrum of natural and man-made materials—materials that present a variety of preservation challenges.

Although we understand the composition and behavior of many materials found in museum collections, numerous questions remain. For instance, while extensive research has been carried out on the conservation of paintings on canvas, identification of some artists' materials has proved a challenge. One difficulty has been accurately identifying the binding substances that have been mixed with pigments to create particular paints. Through its scientific research, the GCI has developed and refined a number of techniques to identify specific binding media. Another problem related to paint conservation has been the lack of a satisfactory means for consolidating flaking paint surfaces on ethnographic objects without altering their appearance or authenticity. Working with ethnographic conservators, the Institute initiated an investigation of the problem that ultimately led to several publications, a training course, and the development of a low-cost kit for identifying organic materials in paint. Materials and methods research at the Institute has also included the evaluation of various protective coatings used on museum objects.

Maintaining a stable museum environment helps limit the deterioration of objects, which is why the GCI advocates preventive conservation, which involves stabilizing entire collections by eliminating or modifying conditions that foster deterioration. It encompasses an understanding of such things as the effects of a museum's heating, ventilation, and air-conditioning systems on the stability of objects; the permeability of the building itself to outdoor pollutants; and display and handling practices. For the care of collections, preventive conservation is the most effective use of limited conservation resources.

The GCI has conducted wide-ranging research on the museum environment—from energy conservation and climate control to pollution monitoring and mitigation—to support preventive conservation efforts. The results of this work have been communicated to the field through publications and preventive conservation courses. In some instances, scientific work in one direction has led to developments in another. For example, GCI research into oxygen-free storage cases for the Royal Egyptian Mummy Collection led to the testing of a safe and effective means of pest eradication for museum objects.

External natural forces can also endanger collections. Collections in flood plains or hurricane paths may be water damaged beyond repair. Those in earthquake-prone areas can be reduced to rubble in seconds if they are not properly secured. From its inception the Institute has been concerned with disaster preparedness, and among its first research efforts was a series of studies to analyze and develop techniques for protecting museum objects during earthquakes.

In studying and developing solutions to the conservation problems of objects and collections, the GCI has sought to employ new and often sophisticated technology—such as the electron microscope—in its investigations. At the same time the Institute remains cognizant of the limited resources most institutions have available for conservation needs. Therefore, as part of their research, Institute staff have worked on low-tech and practical methods for dealing with conservation problems.

The GCI's philosophy in setting priorities regarding objects and collections is consistent with its overall approach to the broad range of conservation issues. Projects are selected according to the urgency of an existing conservation problem, its importance to the conservation field as a whole, and the absence of past or current research on a given topic. The Institute's work continues in such areas as the analysis of artists' materials and the issues of the museum environment—as does the dissemination of its findings through publications and courses.

—Janet Bridgland

The Binding Media Project

THROUGHOUT the ages a variety of substances, such as oils, egg, waxes, natural gums, and resins—alone or in combination—have been mixed with colorful pigments to prepare paints of different colors and hues needed for the creative expression of an artist. While not as diverse as pigments, these so-called binding media, making up about 10 to 30 percent of a paint, are much more complex. Most are natural materials that have been treated in different ways to alter their properties. Typically, they are prone to chemical and physical change over time—which, as in the case of medieval paintings, can be a half dozen centuries or more.

Analyzing the composition of paint layers is an important first step for a conservator working on the cleaning or restoration of a painting. However, in order not to damage a painting, conservators take only an exceedingly small paint sample to analyze—at most, an amount the size of a grain of sand. There are a number of modern analytical techniques that can successfully identify small paint pigment samples. Unfortunately, the identification of binding media in paint is a much more difficult task.

In the late 1980s, when modern methods for analyzing binding media were just beginning to be explored, the Analytical Section of the GCI's Scientific Program started developing the needed methodologies. Work began in 1989 with an extensive review of conservation science and analytical chemistry literature. Based on this review, several promising methodologies were targeted for further research.

The initial effort focused on the use of advanced instrumentation. However, it was recognized that developing only high-tech methods would not serve the field properly. Because many museum laboratories lack the resources to take advantage of sophisticated instrumentation, it was important to develop low-tech, low-cost, and user-friendly methods that could be used widely within the

art conservation community. With this in mind, the Institute developed a kit using medical diagnostic technology for identification of the major binding media types encountered during conservation of ethnographic art objects. To complement this work, the Institute developed and improved thin-layer chromatography tests for the detection of binding media components.

A variety of other methods for analyzing binding media have also been researched; these include advancing the use of infrared microscopy for the study of painting cross sections; analytical strategies for differentiating very similar proteinaceous bindings, to distinguish between, for example, a whole egg and egg yolk only; using an elemental analyzer for very accurate determination of carbon, hydrogen, nitrogen, and sulfur in binding media samples; and using a sophisticated separation process in combination with gas chromatography–mass spectrometry to identify major and minor components of a small paint sample, as well as obtain information about binding media recipes and processes used by an artist when preparing paint. All this research contributed to the development of a methodology for radiocarbon dating of paint layers, a technique critical for authentication of paintings, drawings, prints, and other art objects that contain organic material.

The Binding Media Project was based on collaboration and exchange within the research group and with many experts in conservation science and analytical chemistry. The involvement of the GCI's colleagues from the J. Paul Getty Museum conservation laboratories also made the project possible.

—Dusan Stulik



The binding media identification kit developed by the GCI to assist in identifying major binding media types used on painted ethnographic objects. *Photo: Dusan Stulik.*

Preventive Conservation Courses

PREVENTIVE CONSERVATION is any measure that prevents damage or reduces the potential for damage. Rather than focusing on treating individual objects, a preventive conservation strategy emphasizes the management of the environmental factors that can affect collections—from the functioning of heating and air-conditioning systems to the materials used in constructing storage or exhibition cases. Because it works to improve the overall environment in which collections are kept, it is the most efficient, long-term use of resources for museums. With a comprehensive preventive conservation program in place, the need for individual treatments of objects—while not eliminated—can be reduced.

To encourage a preventive conservation approach, the Getty Conservation Institute since 1990 has offered a two-week course entitled "Preventive Conservation: Museum Collections and Their Environment." Designed for senior conservators and conservation scientists who work in museums, libraries and archives, regional conservation centers, and training institutions, the course updates participants' technical knowledge of preventive conservation and helps them consider effective ways to introduce preventive conservation policies and practices into their institutions.

Preventive conservation is collaborative in nature. Beyond developing preventive conservation policies, conservators must be skillful advocates of those policies, working both with other museum professionals and with external specialists such as architects, designers, engineers, and building contractors. The GCI course therefore stresses the practical aspects of communicating and collaborating with colleagues to improve collections care.

While the course was originally designed with a North American audience in mind, participants—now numbering over 140 from a wide range of institutions—

have included conservators from Europe, Latin America, Australia, and New Zealand. In 1993 the GCI held the course outside of Los Angeles for the first time. In partnership with the Conservation Unit of the Museums and Galleries Commission of the United Kingdom, it offered the course in London for conservators and restorers from Britain and other parts of Europe. The Institute typically seeks a partnership with a local organization whenever it offers a course outside of North America. This local partner works with the Institute to identify particular training needs and to develop a program that addresses those needs.

In June 1995 the GCI offered its second course in London in partnership with the Museums and Galleries Commission. In November 1995, in cooperation with Mexico's Instituto Nacional de Antropología e Historia, it offered its first preventive conservation course in Latin America. Held in Oaxaca, Mexico, for conservators and conservation scientists from Latin America, the course focused on the specific needs of the region.

—Kathleen Dardes



Participants in the GCI's 1995 preventive conservation course at the Museo Regional de Oaxaca in Oaxaca, Mexico. Photo: Kathleen Dardes.

Pollutants in Museums

IT HAS LONG BEEN RECOGNIZED that exposure to atmospheric pollutants constitutes a risk to museum collections. Outdoor pollutants produced by fossil fuels can damage paintings, textiles, and other works of art. Indoor pollutants generated by building materials can harm metal objects as well as other items.

To help institutions reduce these threats to their collections, the Institute began researching the problem of pollutants in 1985. The first two years of research focused on outdoor pollutants including nitrogen oxides, ozone and other photochemical oxidants, sulfur dioxide, and particles. In 1987 research expanded to include indoor-generated pollutants—specifically, formaldehyde, acetaldehyde, and formic and acetic acids. At the same time, the emphasis of research shifted from the macroenvironment (gallery and storage spaces) to the microenvironment (display cases and storage cabinets), where most of the damage from these indoor pollutants occurs.

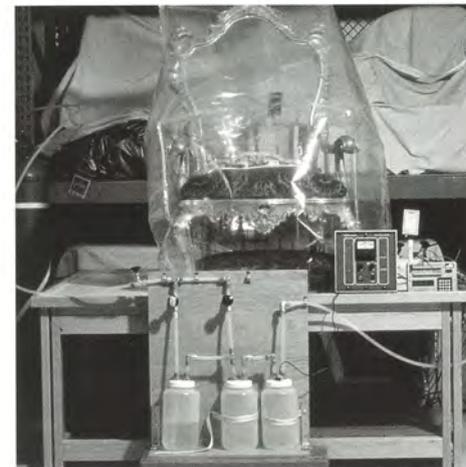
Of increasing concern for collections in urban environments is the soiling of exposed surfaces, such as textiles, which cannot be cleaned safely or without difficulty. Internal combustion engines produce very small particles of nearly pure carbon, which cause extensive soiling. Part of the GCI research was aimed at determining how long it took for soiling to be visually apparent. Research found that perceptible soiling on vertical surfaces could occur as quickly as within 0.3 years within a historic house in Los Angeles with natural ventilation—or take as long as 18 years in a modern art museum equipped with mechanical particulate filtration. Knowledge of the time it takes for soiling to become visible allows collection managers to plan their preventive conservation strategy.

Institute researchers made use of recent technological advances in order to detect the low levels of pollutants found in museum environments (i.e., one molecule of



Ceramic tile in a museum collection, damaged by acetic acid released by the materials used in making its storage cabinet. *Photo: Dusan Stulik.*

An 18th-century Venetian chair at the J. Paul Getty Museum being disinfested by nitrogen anoxia treatment. *Photo: Louis Meluso. Courtesy The J. Paul Getty Museum.*



Nitrogen Anoxia Research

pollutant in one billion molecules of air). A series of simultaneous indoor and outdoor measurements was taken at a variety of museums; the data provided a foundation for further research on the potential damage of pollutants and ways to mitigate that damage.

Studies were carried out to determine the damage gaseous pollutants cause to various types of museum objects. Certain photochemical oxidant pollutants proved detrimental to a number of organic colorants. In addition, various materials were exposed to formaldehyde to measure their sensitivity to the pollutant. These studies confirmed that metals—and to a lesser degree shells—were susceptible to formaldehyde. Yet glass and ceramic glaze were not affected after 100 days of exposure.

Recognizing the limited resources of many museums, researchers studied passive sampling devices that would allow museums to conduct their own surveys with minimal cost and expertise. Through testing, a number of commercially available, relatively low-cost products were identified that met the criteria for museum environments.

This work has enabled many institutions to conduct economical pollutant surveys of their storage and display areas.

Also investigated were mitigation methodologies to reduce significant indoor concentrations of pollutants. Those methods that proved effective used active filtration, passive protection, and combinations of procedures that worked along with the building's ventilation system. The solutions are as simple as placing a tray of a sorbent material in a display case to absorb damaging pollutants or as thorough as identifying and isolating the offensive material from the display or storage space.

The large body of information amassed from this work has been detailed in numerous GCI publications and reports.

—Cecily M. Grzywacz
and James R. Druzik

THE LONGEVITY OF MOST MUSEUM OBJECTS is determined by their environment. Large variations of temperature and relative humidity, as well as air pollution and high levels of illumination, cause many materials to deteriorate. An unsuitable environment can also encourage insect attack and fungal and bacterial growth on organic materials. However, these biological and microbiological assaults, as well as oxidation, can be eliminated if objects are kept in an oxygen-free environment, under chemically inert gases such as helium, argon, or nitrogen.

The efficacy of nitrogen environments for long-term storage of sensitive organic objects was first studied at the GCI between 1987 and 1989, as part of a project to develop a storage case for the Royal Mummies in the Egyptian Museum in Cairo. The GCI designed, built, and tested a nitrogen-filled, hermetically sealed prototype storage case for the mummies in 1989 and in the following years provided technical support and training for local Egyptian production of ten more cases, which were used when the Royal Mummy Room in the Egyptian Museum reopened to the public in March 1994. Two cases of the same design are now being used for the display and storage of the Constitution of India at the Parliament Library in

New Delhi. With GCI technical guidance, the Biblioteca Museu Víctor Balaguer, in Vilanova i la Geltrú, Spain, also built a case for an Egyptian mummy in its collection.

During the mummy case project, a nitrogen atmosphere was successfully tested for eradicating selected insects. The GCI then expanded the study, collaborating with the Department of Entomology, University of California, Riverside, to investigate exposure times required to kill 12 common museum insect pests using a nitrogen environment. Art objects were enclosed in nitrogen-filled bags fabricated from oxygen-barrier film. This proved very effective in eradicating insect infestation in just a week.

To disseminate the results of its research further, the GCI in 1994 conducted a one-week training course on pest management—with a focus on treatment by nitrogen anoxia, or oxygen deprivation—for almost 30 museum professionals from around the world. Because of the course's success, a similar course is planned in collaboration with the Museums and Galleries Commission of the United Kingdom, to be held in London in 1996 for museum professionals in Europe.

The use of nitrogen atmospheres with a very low concentration of oxygen to control pests has distinct virtues over methods relying on chemical fumigants, which contaminate objects, are hazardous to people, and harm the environment. Nitrogen has none of these disadvantages. Nitrogen environments are a safe, effective means to prevent museum objects from deterioration caused by biological factors and oxidation. To improve the practicality of the method, particularly in museums, libraries, and archives, the Institute is investigating the applicability of commercially available equipment for nitrogen anoxia treatment. A large-scale application of the method to mass treatment of artifacts is also being considered.

—Shin Maekawa

Consolidation of Painted Ethnographic Objects

MANY OF THE INDIGENOUS technologies and materials used in the manufacture of ethnographic artifacts did not produce physically durable objects. Indeed, often they were not intended to endure. As a result, their conservation poses a series of challenges.

A particular problem for painted wood objects from Oceania and Africa is flaking or powdering matte paint—paint with a high ratio of pigment to binding medium. Because matte paint adheres poorly to the wood, it requires consolidation to prevent its continued loss. Unfortunately, using a consolidant can lead to discoloration or darkening of the paint. In 1988, recognizing this to be a major difficulty facing conservators of ethnographic objects, Scientific Program staff began addressing the problem through a series of studies. These were followed by the Training Program's development of a course for conservators on matte paint consolidation and, subsequently, the publication of an extended bibliography and review of the subject in a special supplement to *Art and Archaeology Technical Abstracts (AATA)*.

Before solutions to the problem could be researched, it was first necessary to identify the technical difficulties associated both with the fragility of matte paint and with changes in the appearance of objects treated with consolidants. Then, through a review of the literature and laboratory testing, existing methods for treating matte paint were evaluated and several new methods developed. One outcome of this work was the binding media identification kit, a low-cost, low-tech kit for the identification of the wide range of organic materials used as paint binders in ethnographic objects. The results of the research were incorporated into a 1990 course on the consolidation of painted ethnographic objects, then later published in the *Journal of the American Institute for Conservation*. Additional research was done to learn how to re-treat objects whose appearance had been adversely affected by previous treatments.



A painted ceramic female figure, probably produced in Teotihuacán in Mexico between the second and fourth centuries. Photo: Michel Zabé.

A major product of the work of the past six years is the recently released supplement to *AATA* entitled *Matte Paint: Its History and Technology, Analysis, Properties, and Conservation Treatment (with Special Emphasis on Ethnographic Objects)*. The supplement contains 1,125 abstracts of the periodical, monographic, and unpublished literature from disciplines such as anthropology, chemistry, coatings science, ethnobotany, and art history, as well as journals and monographs from the conservation profession. It includes an introductory overview with illustrations and a schematic presentation of the relationships between paint properties and treatments. The history, technology, and use of matte painted objects in various cultural and historical contexts is covered, not only in relation to ethnographic objects but also to paintings, painted architecture, contemporary art, folk art, and many other forms of applied art. This expansive viewpoint will be the format for a new course planned by the Training Program for early 1997.

—Eric F. Hansen

Seismic Damage Mitigation Techniques for Museum Objects

DURING AN EARTHQUAKE, damage to fragile objects on display and in storage in museums can be significant even if the building itself remains intact. Objects can overturn, fracture from stress, or collide with other objects or walls. An object's vulnerability to damage depends on many factors, including the earthquake's characteristics, the building's response, the material composition of the object, and the way it is supported. Although resistance to damage can be improved by modifying either the object or its support, altering the support, rather than the object, is preferred.

The development of techniques for mounting objects in museums located in seismically active regions has received little attention. Its relatively low priority as a conservation problem may be the result of the infrequency of earthquakes. In addition, a difficulty in tackling the problem is the wide variation in object characteristics that needs to be addressed in the design of mounting systems and the lack of guidelines that relate particular characteristics to earthquake damage.

Several years ago the staffs of the Conservation and Preparations departments at the J. Paul Getty Museum, recognizing these problems, initiated studies of mounting systems that would ensure survival of the Museum's objects in the event of an earthquake on the nearby Malibu Fault. The methods developed ranged from a sophisticated base isolation system that limits object movement to simple, unobtrusive tie-down clamps. It was important to quantitatively evaluate the performance of these systems under earthquake stress and to create engineering guidelines that could be applied to the design of mounts for specific objects in the collection.

Working with the Getty Museum and the Civil Engineering Department at the University of Southern California (usc), the GCI initiated a cooperative project to

develop procedures for evaluating the response of individual art objects to seismic events. Because of the large variety of objects and support systems that required analysis, the research team developed generic object classifications and generic object-support-systems classifications. Analytical studies were carried out to model the systems, and a number of experimental tests were performed to determine the validity of the analytical models. Physical models of objects were subjected to simulated but realistic earthquake conditions on a computer-controlled shaking table.

Each of the most important ways in which museum objects respond to earthquakes was analyzed mathematically, and simple, easy-to-follow guidelines were prepared that allowed museum personnel to determine how a

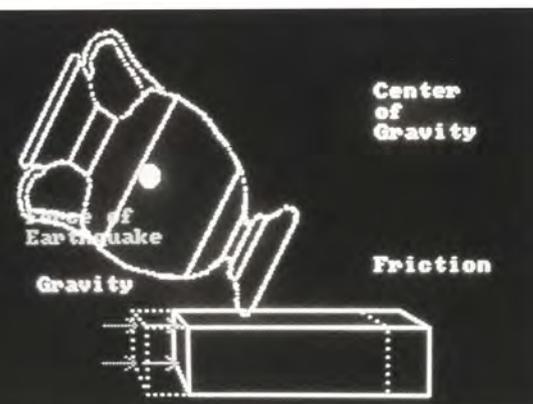
specific object would respond to a quake. The vulnerability of the object could then be assessed. Various generic methods for reducing vulnerability were proposed; these ranged from simply lowering an object's center of gravity or providing appropriately placed, firm attachments to support structures to more sophisticated techniques, such as base isolation.

The results of this pioneering study have been published both as a GCI report and in a conservation journal, making this important information available worldwide to museums located in high-seismic-risk areas.

—William S. Ginell



Left: Seismic engineer Robert Nigbor preparing a shaking table test as part of a study conducted by USC, the Getty Museum, and the GCI. Photo: Brian Leng. Below: Diagram of a typical vessel response to an earthquake. Courtesy of the Antiquities Conservation department of the J. Paul Getty Museum.



Archæological Sites & Monuments

SOME 2,400 YEARS AGO, HERODOTUS GAZED IN AWE AT THE PYRAMIDS OF EGYPT, even then monuments of great antiquity. Besides being a historian, Herodotus was, in today's terms, the first cultural tourist and travel writer, and his accounts mirror our enduring interest in the past. As a window on the past—though often an obscured window—archaeological sites and ancient monuments allow us to look back in time to discern how cultures and civilizations lived, how they built, worshiped, and warred. This knowledge of the past enables us to place our own time in the frame of history.

While the rise of scientific archaeology—marked by 19th- and 20th-century excavations at Pompeii and Troy, for example, and the discovery of Tutankhamun's tomb in the 1920s—heightened public fascination with archaeological sites, this fascination has not led to great awareness of the risks to site survival. As with our natural resources, the archaeological store of sites is finite and nonrenewable, a diminishing resource increasingly under threat. Indeed, many threats to the natural environment and animal species imperil the cultural heritage as well. The 20th century has been witness to an explosive expansion in the global population, with attendant pressures on the archaeological record from industrialization, development, and various forms of exploitation, including an accelerated rate of legitimate excavation driven by scholarly pursuits. The marketplace, too, has created an illicit industry of looting sites for artifacts that eventually find their way into private and public collections. The tragedy of this activity is that looting sacrifices the site—and the vast amount of information that could be gleaned from methodical excavation—to the high market value of a relatively few objects. Lost sites, like extinct species, can never be regained.

A new and powerful factor has emerged in the latter half of the 20th century—mass tourism. In many developing countries, archaeological sites and monuments are a prime attraction for tourists. In purely practical terms, a natural alliance exists between tourism and conservation. Regrettably, in many countries the tourist dollar is funneled into central coffers, with only a pittance being meted out for site management and conservation. The temptation to maximize income from sites often leads to permitting more visitors than a site can safely accommodate. Consequently, physical attrition and vandalism inexorably degrade the monument or site. Similar threats have afflicted many natural and ecological parks, to the extent that in some countries it has become necessary to limit visitors.

The technical, scientific, and management requirements of site preservation are vastly more complex than are those for objects in museums. While museum collections are usually assured security and care within an environment where humidity, temperature, and light levels can be controlled, outdoor monuments and sites are exposed to destructive natural forces and often are not secure from looting and vandalism. Their preservation requires the

input of many disciplines. A synthesis of the expertise of archaeologists, site managers, conservators, scientists, tourism planners, engineers, and geologists is necessary to formulate an overall preservation strategy that can be developed into a master plan for a site.

The objective must be a holistic approach that can diagnose all threats and devise countermeasures, as well as a management blueprint with mechanisms to ensure implementation. A critical part of the planning process must be consideration of the views and needs of the local population.

Comprehensive site management has been an important emphasis in the Getty Conservation Institute's work, as has conservation for archaeologists. Both have been part of training courses, research, and field projects. The GCI has also conducted research and undertaken field projects related to specific issues such as adobe preservation (Fort Selden, New Mexico), site preservation and reburial (Chaco Canyon, New Mexico, and Laetoli, Tanzania), and conservation of sites in humid, tropical environments (Xunantunich, Belize). In addition, it has worked to facilitate the transfer of industrial and engineering techniques and materials to conservation purposes. The problems presented by mass tourism and the looting of sites have been addressed at length in a number of conferences and meetings coorganized by the Institute.

The future will bring yet more tourism pressures on sites, more looting for artifacts, and more destruction of sites. The listing by UNESCO of cultural sites and monuments of the highest value—the World Heritage Sites—has been an important step in raising public awareness, but the list is minuscule when compared with the world's vast number of sites. Future generations may well harshly judge this century—a time when species, both animal and plant, were exterminated, when forests were decimated, and the planet poisoned. All things connect, and so it is with our natural environment and cultural heritage. There is an urgent need to find ways to establish this link in the public mind and, through education, garner support to save for future generations the sites and monuments of humankind. They form part of the spectrum of what we value.

—Neville Agnew

Conservation and Management of Rock Art Sites

ARCHAEOLOGICAL SITES CONTAINING ROCK ART—paintings or engravings—have increasingly come to be recognized as important sources of information for archaeologists, as well as places of fascination to the general public. However, until the Getty Conservation Institute identified it as a pressing need, there was nowhere in the world where the conservation of rock art could be systematically studied.

The GCI approached this problem by providing training opportunities at two different levels: a one-year professional program of full-time study, and short courses of one or two weeks that offered specialized knowledge of rock art conservation to those working in related fields. The one-year program was organized in 1989 with the University of Canberra in Australia as a Graduate Diploma course in the conservation of rock art. The 14 international graduates of the program subsequently took part in a monthlong field project organized by the GCI at the site of Painted Rock in California, where they completed the documentation and removal of extensive graffiti at the site.

The site of Painted Rock was also the locus, in 1987, of the first short, specialized course aimed at conservators. On the recommendation of one of the course instructors, the management of the site was recognized as a greater priority than treatment of its rock art. As a result, the general focus of the GCI's short courses on rock art conservation shifted toward site management. Three courses, in 1989, 1991, and 1992, were taught at the GCI on "Rock Art Site Protection and Management." (These courses led in turn to emphasis on management of archaeological sites in subsequent courses held in Cyprus and China, discussed elsewhere in this section.)

The experience gained in teaching rock art conservation and site management contributed to the GCI Special Project on conservation of rock art in Baja California,



Rock art at Cueva Pintada in the mountains of Baja California Sur in Mexico. Photo: Guillermo Aldana.

Mexico, launched in 1994. Initiated out of concern for the outstanding rock art of the Sierra de San Francisco, the project was undertaken jointly with the Instituto Nacional de Antropología e Historia of Mexico, the Governor of Baja California Sur, and the Fundación Amigos de Sudcalifornia. Project tasks include documenting and analyzing the paintings' deterioration, implementing a management plan for the area's rock art sites, and training four professionals from Latin America in rock art conservation.

After less than 10 years' activity in this field, the GCI has trained 14 rock art conservators (the only professionals with diplomas in the subject); oriented over 60 archaeologists from the United States and abroad to the principles of site management; and established a new approach to the conservation and management of rock art sites in Mexico through its joint project in Baja California. The Institute

has also, through analytical research by its Scientific Program, provided the first identification of the rock art pigments used by California's Chumash Indians. Together with the data on rock art techniques and materials forthcoming from the Baja California project, this information will make a substantial contribution to an area in which little systematic work has yet been done.

—Nicholas Stanley Price

Archaeological Conservation and Site Management

AS DESCRIBED IN THE OPENING ESSAY of this section, our archaeological heritage faces increased risk of destruction from unchecked development, new infrastructure systems, excessive visitation, and inappropriate interventions that attempt to “preserve” sites for tourists. At the same time, archaeological excavations, both licit and illegal, bring to light large numbers of artifacts that eventually find their way to museums, storage facilities, or private collections. Wherever they are deposited, they need care and conservation. Unfortunately, the national authorities and museums who have the primary responsibility for this heritage frequently must work with inadequate resources.

If our archaeological heritage is to survive for future generations, all who can influence its survival—or destruction—must recognize their responsibilities. Seeking to convey this message, the GCI organizes courses, seminars, and conferences for conservators, archaeologists, architects, and government officials.

Conservators have the specific responsibility to preserve objects and sites, yet few have had opportunities for training in the care of archaeological materials. Even fewer people are trained in conservation of archaeological sites and structures. In practice, the responsibility for this heritage often falls on archaeologists, architects, or civil servants whose training does not prepare them for the conservation problems they encounter.

Among all the types of collections, archaeological ones have received the least care. These collections are often vast and comprise a complexity of materials—two factors that make their conservation difficult. They are often held in university museums or in excavation storage areas, where the emphasis is on the gathering of and research on the objects, with little attention being paid to their condition.

To meet the urgent need for specialists in archaeological conservation, the GCI’s Training Program has offered workshops directed at archaeology professors and graduate students in the United States and abroad. These workshops focus on the benefits that can be achieved—in terms of conserved information and objects—if basic conservation principles are observed during excavation. One innovative course on “Conservation and the Archaeologist” was offered in collaboration with UCLA’s Institute of Archaeology in 1993. In recent years, the GCI has been working for the creation of a degree program in archaeological conservation at a U.S. university.

A number of courses on specialized topics for conservators already working with anthropological objects have also been offered. In courses such as “Consolidation of Ethnographic Painted Surfaces,” “Conservation In Situ,” and “Conservation of Artifacts Made from Plant Fibers” (and the publication that resulted from it), the GCI

worked with specialists from all relevant disciplines in order to systematize the knowledge required to care for anthropological collections.

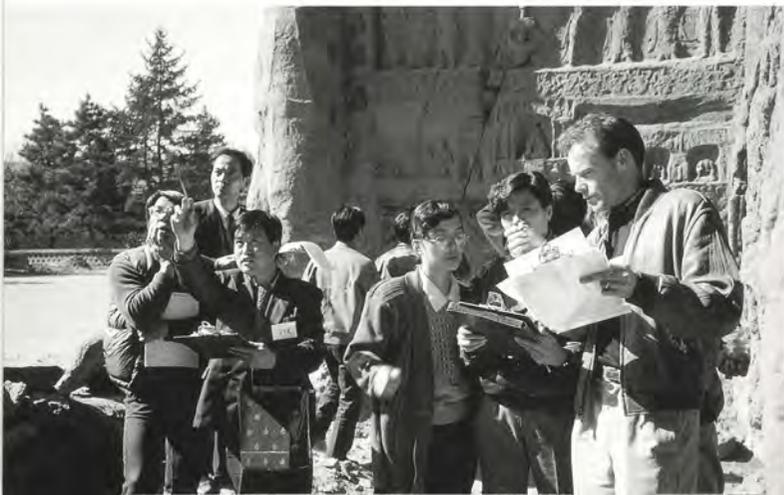
The same activities that have increased the number of archaeological collections around the world have exposed sites to excavation and visitation. The conservation of sites is much more challenging than the protection of objects in a museum. Furthermore, their survival often depends on policy decisions regarding economic development, zoning, and tourism—decisions that are almost always made with little or no regard for site conservation.

The GCI has taken a leadership role in advocating the conservation of sites through professional management. In its courses, conferences, and Special Projects, it advocates a systematic approach to site management that has conservation as its main objective. The approach recognizes that archaeological sites are valued by different groups—archaeologists, local inhabitants, visitors, and national authorities—for different reasons, and that these values need to be both understood and conserved through a planned process that considers immediate and long-term needs.

The GCI has also offered a number of courses on the conservation of specific materials found at sites, such as wall paintings and stone. The courses target professionals working in the field and aim to provide them with an enhanced understanding of the nature and processes of deterioration of specific materials and a methodology for mitigating deterioration.

The Institute continues to develop a critical mass of professionals and policy makers who are concerned with the conservation of our archaeological heritage. Through its activities, it hopes to provide knowledge and tools that will strengthen efforts to preserve the past.

—Marta de la Torre



Participants in the GCI's 1992 management of grotto sites training course at the Yungang Grottoes in Datong, China. Photo: Margaret Mac Lean.

Adobe Preservation

AND PHARAOH COMMANDED THE TASKMASTERS of the people saying, “Ye shall no more give the people straw to make brick, as heretofore: let them go and gather straw for themselves. And the tally of the bricks, which they did make heretofore, ye shall lay upon them” (Exodus 5:6–8). Today the remains of these structures built of mud and straw brick still can be seen in Egypt.

Earth is among the oldest of humanity’s building materials. For tens of centuries, people have combined sand and clay with straw and formed sun-dried bricks, known as adobe in the United States. Even today a significant proportion of the world’s population constructs with earth, in many guises and with different techniques. While some countries have encouraged expensive and inappropriate modern materials to the detriment of traditional architectural designs, there is also a resurgence in the use of earth—in many areas its merits as a no-cost or low-cost material for dwellings have been realized anew.

Adobe preservation is among the most intractable of conservation problems. Under the impact of the weather, rain, and rising damp, adobe reverts to mud and slumps inexorably back into the earth. Traditionally, inhabited earthen houses and buildings undergo annual repair and maintenance, often with the introduction of natural additives in the mud for greater durability. With earthen archaeological sites, however, the objective is to save as much of the original material as possible, and regular maintenance by annual repair work becomes less acceptable because of attrition of authenticity over time.

The GCI became interested in researching adobe preservation in the late 1980s, after excavations at Tel Dan in Israel uncovered a triple-arched gateway of

Adobe ruins of Fort Selden, New Mexico, where the GCI is conducting research on adobe preservation.
Photo: Neville Agnew.



mud brick dating to the middle Bronze Age. Within a short time of exposure to the weather, it began to deteriorate rapidly, and the GCI was approached for help.

The Institute began its research in the laboratory, screening chemical consolidants that might enhance the resistance to erosion by water while retaining the appearance of the material and its ability to “breathe” (to transmit moisture without weakening). Promising results led in 1988 to a collaborative project at historic Fort Selden in New Mexico, where the Museum of New Mexico State Monuments was already conducting adobe research. Some 40 test walls were built and treated in a variety of ways, which included drainage, sheltering, techniques for repair of damaged adobe, and technology of reburial. Initial findings were presented and discussed at an international conference, “Adobe 90,” coorganized by the GCI and organizations active in the field.

The best of the consolidants performed superbly, but high cost has mitigated against widespread use, so that cheaper alternatives have had to be found. Furthermore, when old adobe walls weather, the fabric becomes porous and extraordinarily fragile—chemicals, at the low concentrations used, cannot hold together this weathered outer skin, and the use of greater amounts of consolidant creates an artificial appearance. A new approach—a multistep process using three chemical procedures—has effectively

stabilized sections of the adobe ruins adjacent to the test-wall area at Fort Selden. The walls were first strengthened by impregnation with a polysilicate; then a water-shedding crest of modified mud was built along the top of the wall. The entire structure was next covered with a thin veneer of modified mud sufficient to seal cracks. As a last step, the veneer was covered with a hydrophobic, or water-repellent, siloxane. The treated sections have gone through two winters without change.

Another blend of the procedures is being used to solve a different problem—replacing failed concrete or stucco coats on adobe walls with a more traditional adobe plaster. A durable replacement can be obtained, after the concrete is stripped, by stabilizing the walls with the polysilicate, plastering with amended mud, and spraying with a solution of siloxane.

Meanwhile, the Tel Dan Gate has been partly reburied and roofed by the Israel Antiquities Authority as preservation measures. The GCI is continuing its testing program and remains committed to conserving the important cultural resource of earthen architecture through related research, as well as training. A course on earthen architecture, planned by the GCI in collaboration with ICCROM and CRATERE, will be held in 1996 in Peru.

—Neville Agnew and Charles Selwitz

The China Projects

IN JANUARY 1989 THE GCI AGREED to collaborate with the State Bureau of Cultural Relics (SBCR) of the People's Republic of China on aspects of conservation at two ancient Buddhist sites: the Mogao Grottoes, a World Heritage Site near Dunhuang City in the Gobi Desert in northwest China, and the Yungang Grottoes, near Datong, a coal-mining center some 320 kilometers west of Beijing. Interrupted by the events of Tianamen Square in June 1989, the projects were formally renewed in September 1990.

The ancient caravan routes linking China with the West—enduring from antiquity until about the 15th century—became known in modern times as the Silk Road. A great artery for the exchange of commerce and culture, the Silk Road in its heyday stretched from Xian (the ancient capital Chang'an) to Rome, a distance of 7,500 kilometers across the vast deserts of Central Asia. At the beginning of the first millennium, Buddhism traveled east from India along the trade routes, to take root in China. Dunhuang, an oasis town and gateway to China, was an important arrival and departure point. Here Buddhist monks dug hundreds of rock temples into a cliff face—the earliest in 366, the last around 1300. Nearly five hundred of these grotto temples remain, and lining their walls are paintings on clay plaster depicting legends, portraits, sutras, customs, costumes, and the arts. Some two thousand painted clay figures are also found within the grottoes.

After the gradual abandonment of the Silk Road, the caves remained a focus for local devotion. Following centuries during which the site declined, a Daoist priest named Wang Yuanlu began around 1900 restoring the cave temples and encouraging worshipers to visit. Wang also discovered the famous library in Cave 17, which had been sealed for centuries. Troves of ancient documents were removed by Western explorers early in the century and are now in museums in the West. Today the grottoes are under



Left: A view of the Mogao Grottoes in northwest China. Photo: Luis Monreal. Right: A statue in Cave 194 at Mogao, created during the high Tang dynasty. Photo: © Dunhuang Arts Photograph Company.

the authority of the Dunhuang Academy, founded in 1943. Its first director, Chang Shuhong, and his successor, Duan Wenjie, took the lead in documenting, researching, and publishing on the Mogao Grottoes. Since 1951, when the People's Republic of China officially established the Dunhuang Institute for Cultural Relics, the academy's staff has supervised conservation of the grottoes, directed archaeologists and artists working at the site, and guided the thousands of people who visit each year.

Working with the Dunhuang Academy, the GCI has addressed some of the major problems afflicting the site. Activities have included extensive windbreak fences to mitigate windblown sand sweeping over the cliff face, environmental monitoring within the grottoes, training in monitoring the color stability of the wall paintings' pigments, monitoring the structural stability of the cliff face, data analysis, and developing various engineering and management strategies. In 1993 the Institute, with the Dunhuang Academy and the Chinese National Institute of Cultural Property (part of the SBCR), organized at Mogao the conference "Conservation of Ancient Sites on the Silk Road," bringing together specialists from the West and East—in the ancient tradition of the Silk Road—to discuss common problems.

At Yungang there are over 50 rock-carved temples dating from 460 to 524, cut into a thousand-meter-long sandstone cliff face. Some 52,000 representations of the Buddha are carved directly in the rock, ranging from

miniature bas-reliefs to statues 19 meters high. Many were restored in the Ming dynasty when mud plaster was applied over the eroded carving; the plaster was then elaborately decorated with polychrome and gilding.

The entire gamut of rock deterioration can be seen at Yungang. Damage is caused by several factors, including groundwater carrying soluble salts; rock fractures; physical weathering; pollution from nearby Datong; and dust, smoke, and particulate deposition on sculpture. Stabilization and rock pinning have been extensively undertaken by the Chinese authorities. Polychromy generally shows widespread loss of adhesion and cohesion. Deterioration of the surviving polychromy is due to crystallization of salt leached from rock by migrating water, wind and water erosion, pollution, inappropriate conservation procedures, and, historically, theft. Most external carving has disappeared as a result of weathering, and many statues were removed at the beginning of this century. The GCI and Yungang staff have done extensive testing to mitigate moisture infiltration and to implement environmental and pollution monitoring, scientific analysis of polychromy and pigments, and a formal training course in site management.

Following a joint evaluation of the collaboration by Chinese and Western specialists external to the project, the SBCR and the GCI agreed in 1995 that their collaboration will enter a new phase in the coming year.

—Neville Agnew

The Laetoli Trackway

WITHIN THE NGORONGORO CONSERVATION AREA of northwestern Tanzania lie Olduvai and Laetoli, two sites of great significance in science's attempts to unravel the maze that is the evolution of humankind. Olduvai is famed for its fossil bones of early man, while Laetoli is known for its tracks and traces of animals, including a trail of hominid footprints well preserved in volcanic ash now turned to soft stone. Each site has yielded parts of the mosaic of knowledge about the rise of humankind, but none more startling and intensely human than that of the Laetoli trackway—a short stretch of prints leading almost due north, as though symbolic of the early migrations to people the world.

Badly eroded in parts through natural processes where the overlying soil was thinned, the trackway was excavated in 1978 and 1979 by Mary Leakey to reveal a sequence of well-preserved footprints. After study and recording, they were reburied as a preservation measure. Trees subsequently grew in the reburial fill, and, at the Tanzanian government's request, a collaborative effort with the GCI was mounted to reexcavate, remove tree roots, conserve in situ, record, and study anew the footprints before reburying them again in a manner that will inhibit root penetration.

After several years of preparation and study, as well as consultation with a prestigious international advisory committee, a joint Tanzanian-GCI team conducted a major nine-week field campaign in the summer of 1995. Comprising conservators, archaeologists, palaeoanthropologists, photogrammetrists, and a scientific photographer, the team reexcavated, conserved, documented, and then reburied the southern half of the trackway. In 1996, the remainder of the trackway will be similarly treated.

Reburial as a preservation measure is increasingly accepted as perhaps the only way of saving a remote site



Martha Demas and Neville Agnew of the GCI examining details of the surface of the reexcavated Laetoli trackway during the 1995 campaign. Photo: Angelyn Bass.

such as the Laetoli trackway that cannot or should not be moved or left exposed. Too often fragile surfaces disappear within a year or two when left exposed to the weather and the attentions of souvenir hunters and vandals. The Laetoli site will be preserved in this passive manner—with regular maintenance and monitoring after 1996 by the Tanzanian authorities—to ensure its survival as a scientific and cultural resource. While reburial will mean that the footprints will not be accessible to the public, the Institute is developing reproductions of the trackway for display at the Olduvai Museum and at the National Museum in Dar es Salaam. These will be based on casts of the footprints made by Mary Leakey's team in 1979. The museum exhibits will also include photographs and material explaining the significance of the tracks, their conservation, and the need for protection through reburial.

The Laetoli trackway has great scientific value in the information it has provided, settling a long debate over which was first in the evolution of our species—the development of the brain or bipedalism. The prints, 3.6 million years old, precede by nearly one million years the earliest known stone tools and are therefore evidence that walking on two feet came first.

Their cultural symbolic value is no less profound. These footprints of our distant ancestors—so like our own—are the earliest traces of our long evolutionary journey. Africa, as the womb of humankind, fits the ancient adage today as well as two thousand years ago, when Pliny quoted a Greek proverb: "Out of Africa there is always something new."

—Neville Agnew and Martha Demas

Environmental Monitoring Stations

WHEN A FIELD PROJECT IS BEGUN at a historic site, determining the surrounding environmental conditions is essential for an understanding of the forces of deterioration that may be at work. For conservators and site managers, that information assists in the development of an effective site conservation plan. Unfortunately, for most historic sites, environmental data are seldom available. Typically, there is not even a climatic monitoring station in the area.

In 1990, by adapting existing technologies in areas of environmental science, agricultural science, and industrial engineering, the Institute developed an environmental monitoring system to collect data pertinent to the conservation of historically important sites. It assists in comprehensive analysis of possible causes of site deterioration by gathering data on a site's climate, microclimate, and subterranean conditions, as well as on environmental conditions created by human activity. The system utilizes state-of-the-art electronic sensors, datalogger, and data communication for high-capacity, remote, and autonomous monitoring at the site. As such, it represents an important advance over the kind of handheld monitoring devices previously used by conservators.

The low-maintenance monitoring station is powered by a solar panel connected to a rechargeable battery and can be configured according to the requirements of a particular conservation project. Sensors to measure wind speed, wind direction, intensity of solar radiation, air temperature, relative humidity, and precipitation are standard in the system. In addition, the system can provide information on the presence of carbon dioxide, oxygen, and soil moisture, as well as record other conditions, such as surface and subsurface temperatures, dew condensation, and structural stress. All or some of the sensors are activated at a preset interval, and the processed data are recorded in the system over a programmed period.

Chaco Canyon

The system operates automatically 24 hours a day for an extended period.

Recorded data are transferred from the monitoring station to a personal computer, which produces data diskettes for later analysis. In many projects, a base station is set up at the conservation laboratory or site manager's office, and local staff members are trained to maintain the system and analyze the data. Some monitoring stations are equipped with modems and phone lines to allow transfer of the data to the GCI.

The environmental monitoring stations have been installed at many historic sites where the GCI has conducted field conservation projects. These have included sites in Belize, Bolivia, China, the Czech Republic, Ecuador, Egypt, and the United States. The stations can also provide useful insight into environmental conditions by counting visitors in order to identify their effect on the microenvironment within buildings and subterranean structures, such as caves and tombs. This information allows managers of the sites to develop suitable visitor management plans.

—Shin Maekawa

Shin Maekawa of the GCI assembling an environmental monitoring station inside the tomb of Queen Nefertari, Egypt. *Photo: Neville Agnew.*



IN NORTHWESTERN NEW MEXICO lie the monumental remains of a vanished culture. Over a thousand years ago in Chaco Canyon, the Native American Anasazi established a series of settlements that included elaborately irrigated fields, a vast system of roads, and hundreds of stone-masonry structures, built from carefully cut blocks of sandstone. Extensively excavated since the late 1800s, the magnificent archaeological ruins of this ancient community now form Chaco Culture National Historical Park, a UNESCO World Heritage Site managed by the U.S. National Park Service (NPS).

In their mostly exposed state, the structures at Chaco Canyon—dwelling and storage rooms, plazas, and kivas—are subject to continual natural deterioration. The most erosive factor is water. In winter, snow piles up on the tops and at the base of the walls. When it melts, the water percolates down from the top, freezing at night within the walls and causing the masonry to buckle. Snow melting on the ground leads to rising dampness that erodes the base of the walls. Torrential thunderstorms during summer months cause surface erosion of soil and loss of mortar in the masonry. And, as at so many archaeological sites around the world, the demands of increasing visitation and of continuous protection of the ruins far exceed existing resources.

In 1991, the NPS and the GCI began a project to test strategies for protecting architectural remains such as those at Chaco. The project was based on the use of backfilling as a protective measure that is flexible and easily reversible, one that reduces maintenance while permitting visitation and interpretation of the site.

Although backfilling has long been practiced as a means of preserving archaeological remains, its effectiveness has never been systematically studied. In order to document backfilling's benefits, the project team reexca-



A view of Pueblo Bonito, the ruins of an Anasazi settlement in Chaco Canyon, New Mexico. *Photo: Guillermo Aldana.*

vated parts of six rooms in Pueblo Bonito that had been originally excavated in the 1890s and 1920s and partially backfilled soon thereafter. During the reexcavation, the rooms' present condition was extensively documented, then compared with their condition as originally excavated. The results dramatically demonstrated backfilling's efficacy, revealing excellent preservation of materials and features in areas that were reburied, while long-exposed portions of the site displayed significant deterioration. At the same time, the reexcavation pointed to the need for a more systematic approach to backfilling that would consider such factors as the types of materials being buried (e.g., wood, plaster, etc.), the climate and hydrology of the area, and the use of specialized fills and materials to achieve the optimal burial environment.

The GCI-NPS team also developed experimental strategies to protect walls from snow melt and to confront the problems posed by partial backfilling. All such procedures utilized geodrains and/or geomembranes—products made of geosynthetic materials used extensively in civil engineering—designed to prevent water migration, limit capillary rise of moisture, drain off surface water, or provide protection from snow accumulation. These strategies have potential applicability to other archaeological sites.

Using the lessons learned from the backfilling and testing programs, the team implemented a backfilling procedure for partial reburial of the ruins at Chetro Ketl in Chaco Canyon. This is part of a parkwide program to use partial backfilling to reduce maintenance while fulfilling the park's mandate to present the site to the public.

—Martha Demas

Xunantunich

BUILDINGS IN HUMID TROPICAL AREAS experience significantly different deterioration than structures in colder, drier, and more temperate regions. Lichens, fungi, and mosses on the almost continuously damp surfaces of exposed structures penetrate stone and loosen grains, thereby decreasing the stone's cohesive strength. High relative humidity and frequent rainfall gradually break down the soluble components in building materials. At the macro level, the intrusion of roots from lush tropical vegetation causes structural damage to abandoned buildings—especially archaeological ruins.

In 1992 the Getty Conservation Institute began collaborating with archaeologists from the University of California, Los Angeles (UCLA), and the Department of Archaeology in Belize to address some of the problems of conserving archaeological sites in humid tropical environments. The site of Xunantunich, an ancient Maya city inhabited between 700 and 1100 C.E., was chosen as the venue for project activities because it offered a rare opportunity to integrate conservation with excavation. Here, UCLA archaeologists are conducting a long-term research and excavation project that includes development of the site for tourism. The collaborative project has focused on three areas: scientific research and testing, architectural conservation, and training.

To better understand deterioration in humid tropical environments and to develop methods for conserving buildings, decorative stone, stucco, and mortar, the GCI developed a laboratory and field-testing program, now in its third year, researching the use of chemical consolidants for strengthening limestone and the use of biocides for controlling microflora growth. Solar-powered environmental monitoring stations were installed at the site to record weather data, which is being used to define test conditions for artificial aging tests in the laboratory.

Conservation of excavated structures disrupted by the intrusion of vegetation into the building fabric sometimes necessitates the dismantling and rebuilding of unstable walls and the addition of new materials. All too frequently, such interventions have led to total reconstruction and an inaccurate interpretation of the original structure's appearance.

At Xunantunich, current excavation is exposing several pyramidal structures in the central plaza. Archaeologists and conservators have together established a plan for the pyramids' conservation that would address a number of conflicting needs and values: the need to stabilize the structure and prevent further deterioration; the scientific value of retaining original materials; and the educational value of providing visitors with enough visual information to understand the structure. A three-year, on-site training program for technicians from the Belize Department of Archaeology in the principles and methods of architectural conservation took place both at Xunantunich and at the site of Copán in Honduras. In addition, the remains of a stucco frieze that originally surrounded all four sides of the largest pyramidal structure have been studied and conserved by specialists from Mexico's Instituto Nacional de Antropología e Historia, who also provided training for local technicians in the preservation of the frieze.

A key element of the project is conservation training. The GCI has organized seminars and workshops in Belize on management of archaeological sites and collections. An important initiative has been the development of a management plan for Xunantunich involving all parties with an interest in the site's preservation. The participatory process used for Xunantunich is intended to serve as a model for the development of similar plans for archaeological sites throughout Belize.

—Martha Demas



The east frieze located at the top of the "Castillo," the tallest structure at the Maya site of Xunantunich in Belize. Photo: T. Torres. Courtesy of the Xunantunich Archaeology Project.

Historic Structures & Cities

TO CATCH A GLIMPSE OF SOME CULTURAL TREASURE OF THE PAST does not necessarily require a visit to a museum or a trip to a distant archaeological site. Sometimes it happens when one does not expect it—while rounding a city corner on foot, driving through an unfamiliar town, or passing a place one has been to on a thousand occasions but suddenly *really* sees for the first time.

The places people live are often interlaced with elements of cultural heritage—from the entire core of a historic city to a single structure to a work of art that in the midst of living spaces defines those spaces and forms a part of their history. For many in communities across the globe, these kinds of surroundings are part of the texture of their lives—perhaps acknowledged, perhaps not, but present nonetheless. Because they form part of daily life they can play as much—if not more—of a role in providing a sense of identity for a community as objects viewed behind glass cases or ancient ruins seen through a fence.

While this proximity to people gives historic structures and cities life, it places strains on their preservation. As inhabited places, they are exceedingly complicated to conserve. Unlike museum collections and archaeological sites, they cannot be isolated from use or modification. Historic city centers are subject to the legitimate demands of their populations for the components of modern urban life, such as transportation, plumbing, electricity, and telephone service. Similarly, inhabited historic buildings cannot and do not remain unchanged over time. They, too, are subject to adaptation as residential needs change.

Making a historic city a modern one without losing or diminishing its unique character is an enormous conservation challenge. When car and bus traffic crowds narrow streets originally intended for foot traffic, when telephone lines and commercial signage obscure centuries-old facades, when pollution, overcrowding, and poor maintenance accelerate the process of deterioration, and when mass tourism brings with it not only increased revenue but an alteration in the traditional commercial life of the community, the conservation problems and solutions are far more multifaceted than those of a painting or an archaeological site.

Any effort to preserve historic cities requires attention to the real social and physical needs of the contemporary population, as well as the economic realities of the community. As living places, historic cities are more than the sum of their structures—they encompass a cultural life as well. Integrated with the physical are customs and traditions, social and economic relationships, religious functions, and political life. Conservation in historic cities is both a physical and political process. To succeed, preservation programs must have the understanding and support of those who make these cities their home. Such programs cannot simply adopt the standards of museum conservation or archaeological site manage-

ment. Rather, the conservation of historic cities requires its own standards and processes that recognize what is practical and possible while still striving to preserve authenticity.

The GCI has embraced an approach to the conservation problems of historic cities that involves working with local agencies, governmental and private, to develop strategies that capitalize on the cultural asset represented by the historic core and that use incentives for social and physical investment as part of the preservation process. An important component of this effort is increasing public awareness of the importance of conserving the historic core and eliciting public participation in decision making.

It is not only the preservation of historic cities as a whole but individual historic structures as well that has been of concern to the Institute. Among the threats to historic structures in many places is the destructive power of earthquakes. The conservation challenge in coping with this threat is developing ways to strengthen structures while maintaining their historical integrity. Consistent with the disaster-preparedness activities it has conducted, the GCI is engaged in several projects to research and develop measures that add to a building's ability to withstand seismic stress without destroying or diminishing the very features that make a structure worth preserving.

Within historic structures are works of art that pose their own complex conservation problems, depending on the materials that compose the works and the specific conditions of their settings. In this area, the Institute has selected projects where culturally and historically significant art is threatened and where technical problems of interest or importance are involved. While each project has presented a different technical challenge, the philosophy behind the treatment of these works has been the same—to clean, consolidate, and preserve (rather than “restore”) and to find ways to protect these works over the long term from the forces damaging or destroying them.

Conservation of cultural heritage in outdoor settings presents complex challenges, particularly if that heritage is part of a living community. Without question, the conservation of this heritage is complicated by factors that extend well beyond technical conservation concerns. The GCI believes that finding the appropriate balance between the social and physical needs of a historic community and preserving its architectural and artistic heritage is an essential undertaking because so much of the world's cultural heritage lies in inhabited places.

—Jeffrey Levin

The Historic City of Quito

IN THE HISTORIC CENTER OF QUITO, ECUADOR, an area of less than one square kilometer, there exist some 18 churches, convents, and cloisters; 25 major public buildings; 12 houses of prime historic importance; several theaters; 6 museums; and over 20 places of general interest, including Plaza Grande, Plaza de San Francisco, and Plaza de Santo Domingo. The city, founded in 1534—a scant 42 years after the arrival of Columbus in the New World—is a repository of immense importance containing paintings and sculpture, archives of historical documents and religious material, and Inca archaeological artifacts and treasures. Because of its extraordinary patrimony, Quito was declared a World Heritage Site by UNESCO in 1978.

Though much has already been done by the authorities in Quito, virtually all the historic buildings and artifacts within the city's center are in need of care and conservation. To these conservation needs must be added the legitimate aspirations of the city's inhabitants for adequate housing, work security, safety, income, and access to consumer goods. With substantial migration from rural areas to urban Quito, the strain on infrastructure and housing has become intolerable, and property owners in the historic center have moved north to new developments in the city. The historic properties these absentee landlords own have been rented out and allowed to lapse into varying degrees of decay.

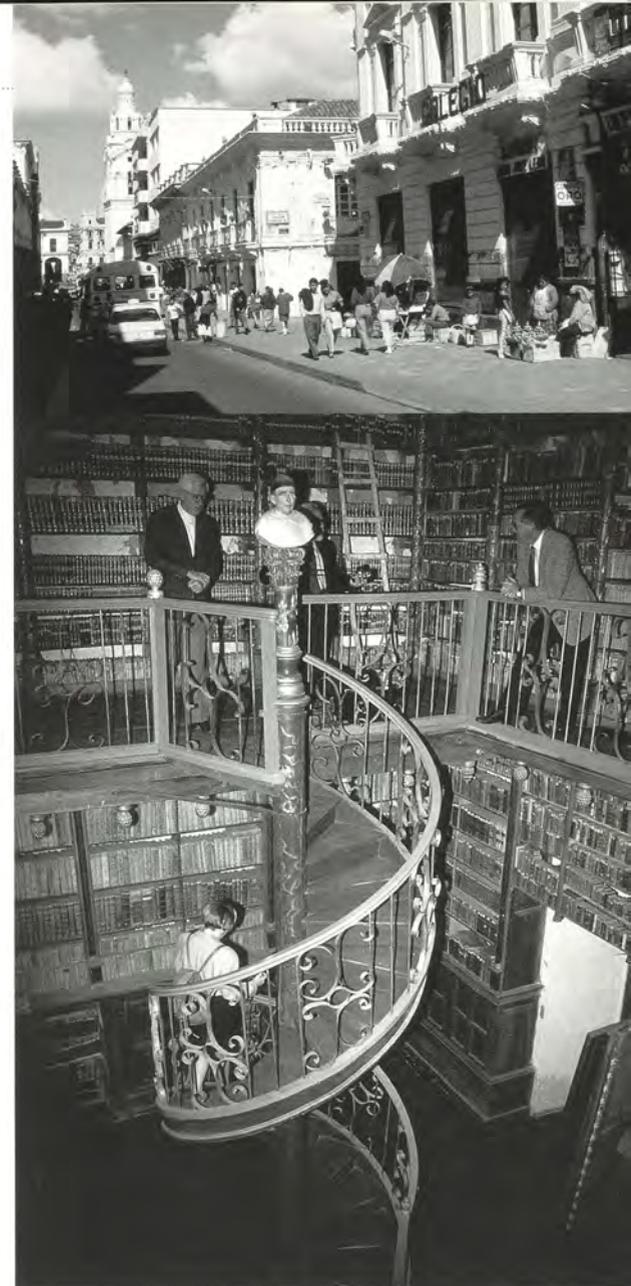
Despite local and international recognition of the city's historic significance, the pressures of modern urban life continue to take their toll. Overpopulation and traffic, combined with a lack of infrastructure for tourism and insufficient social services, have resulted in a decline in quality of life in the historic center. Other factors contributing to this decline include a 1987 earthquake that severely damaged buildings in the historic district, many

of which remain unrepaired. Poor air quality, due to the incomplete combustion of gasoline at Quito's high altitude and lead in the gasoline—as well as traffic congestion and the absence of vehicle emissions regulations—has added to the deterioration of historic buildings.

The Municipality of Quito is playing a leading role in rehabilitation, in part through municipal legislation. The Fondo de Salvamento, a public agency, is working with Municipal Planning Office specialists responsible for management, planning, and public awareness. Supported by present and former mayors of Quito, essential steps are being implemented.

Following a GCI cosponsored Quito conference in 1990 on the conservation of historic cities, the Institute in 1991 joined with the Municipality and the nonprofit Caspicara Foundation to assist preservation in the historic center. Activities included a photogrammetric study of historic buildings on the principal thoroughfare, García Moreno Street; investigation of the color history of building facades; a study of construction systems of buildings; preparation of architectural drawings; and construction of a scale model of the street.

The Institute also undertook climatic monitoring to understand the relationship between meteorological conditions and the dissipation of traffic pollutants, provided conservation advice on gilding and polychrome sculpture for the church of La Compañía de Jesús, and organized an international colloquium on the seismic retrofitting of historic buildings. Conservation, cataloguing, and training in library management were undertaken at the monastery of La Merced jointly by the Institute and the Getty Center for the History of Art and the Humanities, and the Getty Grant Program has provided funding for earthquake-damage repair of La Merced church. To promote preservation awareness and support, a public opinion survey was



Top: Traffic and street vendors on García Moreno Street, which runs through the heart of Quito's historic city center. Photo: Guillermo Aldana. Bottom: The library at the monastery of La Merced in Quito. Photo: Jesús Lopez.

undertaken, a color poster showing how a rehabilitated García Moreno would appear was distributed, and a 30-minute video on the historic center was produced.

In mid-1994, a full report on the Institute's work in Quito was presented to Mayor Jamil Mahuad Witt.

—Neville Agnew

Seismic Stabilization of Historic Structures

CALIFORNIA AND THE BALKANS are two areas where earthquakes pose substantial threats to both life safety and the survival of historically and culturally significant buildings. In California, only a fraction of the adobe buildings originally constructed during the Spanish colonial period have survived. Missions, presidios, and residences have either been destroyed or so extensively reconstructed that features ranging from elaborately decorated interiors to wall paintings by Native American neophytes have been lost forever. Similarly, in the Former Yugoslav Republic of Macedonia, Byzantine churches dating from the 9th to the 14th centuries have been subjected to devastating earthquakes that have toppled towers and domes and, in many cases, destroyed fresco paintings that adorned interior walls. The fact that many of these churches still exist results from their construction design, which imparts some flexibility to the stone, brick, timber, and lime mortar structures.

A large number of these historic structures are still in use, and the problem of ensuring life safety and building

integrity without compromising historic values has been of ongoing interest at the GCI for the past five years. Two seismic retrofitting design projects have been in progress—one dealing with American adobes, the other with Byzantine churches.

Seismic retrofitting is the term used to describe building modifications intended to prevent catastrophic structural failure and ensure the survival of occupants. With historic buildings, it is important that retrofitting be designed to minimize intervention and to preserve as many authentic features as possible.

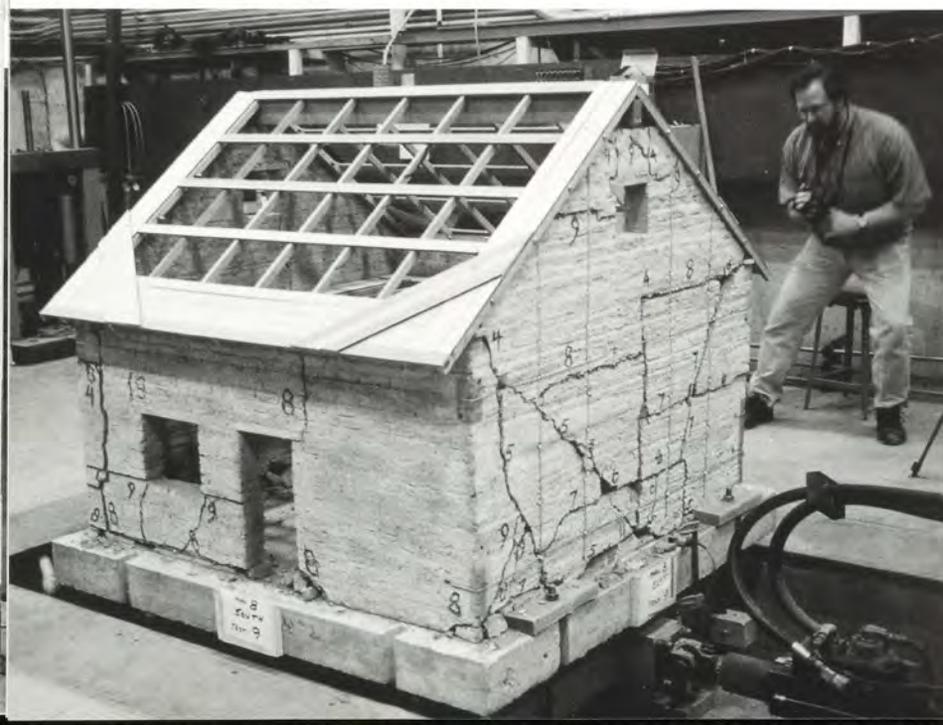
Unlike wood, steel, or concrete structures, thick-walled adobe buildings can crack without necessarily losing their ability to remain standing. Accordingly, the GCI's adobe retrofitting project adopted an approach aimed at improving stability rather than strength. Methods were devised that would be minimally invasive but still prevent wall overturning and roof collapse, the two principal catastrophic damage modes. The methods employed thin vertical and horizontal cord straps and ties, wall center-

cores, and continuity provisions that tied the roof to the walls. To test their effectiveness, 1:5 scale model adobe buildings were constructed and subjected to simulated earthquakes on a computer-controlled shaking table at Stanford University in California. The test results confirmed the ability of these simple measures to confine damage to easily repairable, nonstructural cracking. Final tests of a 1:2 large-scale model are currently being performed on a large shaking table to evaluate gravity loading effects that could not be simulated on the smaller models. The results of these studies will be made available in the form of the upcoming GCI publication *Guidelines for Seismic Stabilization of Historic Adobe Structures*.

For the project on seismic retrofitting of Byzantine churches, a different approach was taken. An actual church, St. Nikita, near Skopje, was selected as a prototype and its dynamic response behavior determined experimentally. An assessment of the most likely earthquake risk was made based on soil conditions and the region's history of seismic activity. A 1:2.75 scale model of the church (weighing 21 tons) was built with local materials; using a shaking table, the model was then subjected to several possible earthquake spectra until structural damage occurred. After being repaired and retrofitted with horizontal and vertical steel ties placed within the walls, the model was shaken again. The retrofitting greatly increased strength to the point that the model was able to withstand a very severe earthquake without significant structural damage.

The methodology developed in this project is generally applicable to similar structures throughout the Balkans, the eastern Mediterranean, and Central Asia. Both the adobe and Byzantine church studies demonstrate that seismic stabilization methods for historic structures can be devised that are effective and considerate of the cultural values inherent in these irreplaceable buildings.

—William S. Ginell



An adobe model on the shaking table at Stanford University during 1995 tests of structure stabilization techniques. Photo: William S. Ginell.

The St. Vitus Mosaic

THE LAST JUDGMENT mosaic on the Golden Gate of St. Vitus Cathedral in Prague Castle is considered the most important monumental medieval mosaic north of the Alps. It was completed in 1371 at the request of Charles IV, king of Bohemia and Holy Roman Emperor, who during his reign made Prague the empire's center of power, religion, and knowledge—as well as a place of splendor.

Facing the Royal Palace, the mosaic encompasses 84 square meters (904 square feet) and depicts the Last Judgment in triptych form. At its center is Christ surrounded by angels and apostles. Kneeling beneath are six saints of Bohemia, and below them are portraits of Charles IV and his fourth wife, Elizabeth of Pomerania. On the triptych's two side panels are depicted heaven and hell. Thirty-one shades of colored glass, plus gilded tesserae, can be found in the approximately one million glass pieces that compose the mosaic.

The mosaic's glass is different from the glass typically used by mosaic artists in Italy. In Central Europe the soda needed for glassmaking was not readily available, so glass-makers used potash (potassium carbonate) extracted from the ash of burned wood. Because potassium glass is less stable than sodium-based glass, the St. Vitus mosaic started to fade under a layer of corrosion products soon after completion. Several attempts were made to revive the mosaic, the first as early as the 15th century. In 1619 the mosaic was plastered over, only to be cleaned again in 1621. Despite restoration efforts in the 19th century, by 1890 the mosaic's deterioration was so severe that it was removed for restoration. Then, without any protective coating, the mosaic was reinstalled in 1910, and its slow deterioration began anew. Another major restoration was conducted in the late 1950s, but the periodic maintenance requested by the mosaic's restorers was not carried out, and in several years, the corrosion processes advanced so far that today the mosaic is almost invisible.

Since October 1992, the GCI and the Office of the President of the Czech Republic have been collaborating on the conservation of *The Last Judgment*. The project began with collecting information on the history of the mosaic and its past treatments. Preliminary conservation assessment of the mosaic was done in collaboration with Italian conservators who had previously worked on the St. Vitale mosaics in Ravenna. The Fraunhofer Institute for Silicate Research in Würzburg, Germany, and the Materials Science Department of UCLA are assisting in development of protective coatings for the mosaic. A series of tests in aging and pollutant-exposure chambers are evaluating the long-term stability and required reversibility of coatings systems being considered for the mosaic. Various methods of mosaic cleaning have also been researched. All proposed technological steps and planned interventions are being discussed in detail with an advisory group of leading Czech art historians, historians, and conservators.

While actual treatment of *The Last Judgment* is anticipated for summer 1997, all parties involved, including the Office of the President, are emphasizing thoroughness over speed. An important facet of the collaboration is to build a team of Czech conservators who will, after completion of the project, continue to monitor and maintain the mosaic.

—Dusan Stulik



Conservators using a hydraulic lift in 1992 to examine *The Last Judgment* mosaic on Prague's St. Vitus Cathedral. Photo: Neville Agnew.

The Siqueiros Mural

THE ONLY SURVIVING PUBLIC MURAL in the United States painted by the great Mexican muralist David Alfaro Siqueiros is situated on the outside of a second-story wall in downtown Los Angeles. Called *América Tropical*, the mural has as its centerpiece an Indian crucified on a double cross with an American eagle above it. In the mural's upper right-hand corner are two revolutionary soldiers, one pointing his rifle at the eagle.

Controversial from the day it was unveiled in October 1932, a third of the 24.0 by 5.5 meter mural was painted over shortly after its completion. Some years later, the entire mural was covered with white paint. Subjected to the damaging effects of sun, rain, smog, and earthquakes, the painting began to deteriorate as the white paint covering the mural slowly eroded. The mural faded and in places peeled. In addition, portions of the plaster started detaching from the wall, and the mural's surface, subjected to atmospheric pollution, became coated in dirt.

In 1988 the GCI joined with El Pueblo Park and the Friends of the Arts of Mexico Foundation to preserve what remained of the mural and, after consultation with conservators and engineers, developed a comprehensive preserva-

tion program for *América Tropical*. The first phase began in 1990 when a conservation team spent several months removing the remaining white paint from the mural, cleaning and consolidating the painting layer, and reattaching the detached cement plaster to the brick wall. Traces of asphalt running along the base of the painting were also eliminated.

For over a year and a half beginning in May 1991, an Institute-installed environmental monitoring station adjacent to the mural collected data that provided valuable information about environmental conditions to help guide the designing of a protective shelter. Then, in spring 1994, an on-site digital imaging system designed at the Institute was used by staff to capture and store on computer detailed, high-resolution images of the entire mural. The information will assist in *América Tropical's* documentation and final conservation, and in the creation of a public exhibition adjacent to the mural.

A primary goal of the project has been to provide public access to the mural. The initial step in that process was the seismic stabilization of the building on which the mural is painted, as well as the stabilization of adjacent

buildings, both of which projects were undertaken by the city of Los Angeles. In addition, the Institute, together with other organizations, will be reaching out to the public and private sectors to underwrite the cost of constructing a permanent mural shelter, a public viewing platform, and a historical information area for visitors.

Once a permanent mural shelter is installed, phase two of *América Tropical's* conservation will proceed. This will include cleaning, stabilization, consolidation, and aesthetic reintegration—i.e., limited inpainting in areas of defined loss to the painting layer. Because of the problematic nature of the materials used in its creation, combined with years of neglect, the Siqueiros masterpiece can never be returned to anything close to its original condition. However, even in its present faded state, the work's artistic power remains. Conserving the mural and presenting it to the public offer an important opportunity to explore questions of political controversy and artistic expression—questions still debated today.

—Jeffrey Levin



América Tropical after its completion by David Alfaro Siqueiros in 1932. Photo: John Weiskall. Courtesy of El Pueblo de Los Angeles Historic Park.

The Bas-Reliefs of the Royal Palaces of Abomey

THE MOST FAMOUS AND HISTORICALLY SIGNIFICANT site in the West African Republic of Benin is a complex of earthen structures known as the Royal Palaces of Abomey. It is there that the Benin government and the Getty Conservation Institute are collaborating on the study and conservation of 50 polychrome earthen bas-relief panels that were removed several years ago from a palace building now known as the Salle des Bijoux (Hall of the Jewels), constructed by King Glélé (1858–1889).

The Kingdom of Dahomey (today Benin) was founded in 1625 by the Fon people and for centuries was a powerful and prosperous center of culture and trade, including the slave trade. The first royal palace in Abomey, the kingdom's capital, was constructed in 1645. Thereafter, each king built his palace near that of his predecessor. Today, the restored 19th-century palaces of King Guezo and King Glélé form the Musée Historique d'Abomey. In 1982 the site was inscribed on UNESCO's World Heritage List.

Earthen bas-reliefs were an integral decorative feature of the palaces. Their function was to represent the significant events in the evolution of the Fon and their domination over a vast territory. The Salle des Bijoux bas-reliefs are particularly important because they are thought to be the last remaining original bas-reliefs from the Royal Palaces (all the other palace buildings have been recently reconstructed). Measuring approximately one meter by one meter, these bas-reliefs depict human and animal figures in allegorical scenes and collectively convey the Fon's complex mythology, customs, and rituals. They provide an invaluable artistic and historic record of Benin's rich cultural heritage.

Since 1993 an international team of wall paintings conservators, museum specialists, and scientists, including staff of the Getty Conservation Institute and the Benin



Earthen bas-relief battle scene from the palace of King Glélé in Abomey.
Photo: Susan Middleton.

Ministry of Culture, have been addressing the problems afflicting the bas-reliefs. Exposure to extreme weather conditions and termite and insect attacks caused serious erosion and deterioration of the bas-reliefs while they were on the facade of the Salle des Bijoux. Over the years they were repaired and repainted. In 1988 they were removed from the building's walls and framed in heavy cement-stabilized earthen casings. Since then, the Salle des Bijoux itself has been torn down and is being reconstructed. The 50 surviving bas-relief panels remain in fragile condition and vulnerable to mechanical damage when moved.

After reviewing existing documentation on the bas-reliefs' history and condition, and after studying their material composition and causes of deterioration, the project team developed and implemented a conservation treatment plan that includes written, graphic, and photographic recording of the condition of each bas-relief and

the treatment carried out. Conservation includes emergency treatment, consolidation of the earthen support and of the paint layer, reattachment of fragments and paint flakes, cleaning, and reintegration in a treatment of minimal intervention. The project's final phase will involve planning of a maintenance and monitoring program to ensure the bas-reliefs' long-term survival and the design of a permanent exhibit. On-site training of Benin Ministry of Culture staff in the conservation, care, and maintenance of the bas-reliefs is an important part of the project, which is expected to be completed by spring 1997.

—Leslie Rainer and Francesca Piqué

Public Awareness & Advocacy

IN OUR COMMUNICATIONS-CENTERED AGE, it is difficult to imagine a collective endeavor that can thrive without the tools of communication. Conservation is no exception. Whether the objective is the development of new treatment techniques or preventive conservation strategies, greater collaboration between conservation organizations, or increased public support for conservation itself, communication is fundamental—communication *internally* among conservation professionals and communication *externally* to the larger public.

At the Getty Conservation Institute's inception, increasing conservation knowledge and awareness through communication was an important part of its mission. In its first few years, the Institute's efforts were directed primarily toward the conservation professional. More recently, the GCI, while not relinquishing that initial responsibility, has expanded its areas of communication to include the general public.

The Institute's early concentration on professional information exchange was in response to a generally recognized need to improve the collection and dissemination of information for conservation professionals. When the Institute was established, one of its stated goals was to become a resource by addressing the lack of access to a comprehensive collection of conservation literature and documentation and the lack of information *about* information. Through a variety of means, the GCI has worked to further an exchange between professionals, enhancing their awareness of work being done by their colleagues around the world, and of the concerns they share. This has been done, in part, through publications, conferences, workshops, and training courses.

The dissemination of information is not limited to conservation methodologies. Included in this effort is the heightening of awareness of threats to cultural heritage—such things as lack of disaster preparedness, the illicit trafficking in cultural property, and the threats posed by armed conflict.

Ultimately, though, professionals exchanging ideas among themselves is not enough. The preservation of the past depends upon the attitude of the public at large. Ignorance of the fragility of our cultural heritage—and indifference to its fate—contribute to its ultimate loss. The problem faced by those in cultural heritage conservation, like their counterparts in environmental conservation, is that they require support from the general public if they are to accomplish even a small portion of the enormous task set before them.

The conservation community needs to create within the larger community a sense of shared responsibility for the preservation of our cultural heritage. The environmental movement helped the public recognize that clean air and water and the preservation of forests were not abstract virtues but critical to the quality of life. A similar case must now be made

for our cultural heritage. We can physically survive the loss of our heritage, but only at a tremendous cost to our sense of identity.

In the early 1990s the GCI began working to help enlarge the public's understanding of conservation and the need for cultural heritage preservation. The first step was in 1991, when the Institute altered the format of its newsletter in order to reach out to a broader audience. Since then, it has begun employing additional means with the same objective of educating the general public in order to create a larger constituency for conservation. Among these activities have been exhibitions dealing with conservation and questions of cultural heritage, and video productions depicting some of the Institute's special projects.

At the same time, through informal discussions, conferences, and courses, the Institute has been engaged in advocacy, helping those who make public policy become more aware of the things they can do to help preserve the past. The success of this advocacy is linked to public awareness—after all, decision makers are more likely to be responsive to conservation programs and policies when they know that the general public supports them. Communicating a sense of shared responsibility for the preservation of the past should become an objective of ever-increasing importance to the conservation community.

—Jeffrey Levin

Professional Information Exchange

PROFESSIONAL INFORMATION EXCHANGE is a part of many different programmatic activities of the Institute. Three particular efforts were especially important during the GCI's first 10 years.

When the Getty Trust consulted with the conservation profession in the early 1980s about needs in the field, one area identified was improved access to information about conservation techniques and research. Despite a growing body of conservation literature, the many languages in which information was published, combined with important advances in related disciplines, made it difficult for practitioners to keep abreast of current thinking.

Conservation's most important bibliographic reference publication, *Art and Archaeology Technical Abstracts (AATA)*—established in 1955 by the International Institute of Historic and Artistic Works—was at the time produced by a part-time managing editor and an international network of volunteer abstractors and regional editors. Without a full-time staff and a computerized database, systematic coverage of the literature was virtually impossible.

In 1983 the Trust assumed operational and financial responsibility for *AATA* with a commitment to expanding its geographic and subject coverage and upgrading basic features such as cross-referencing, indexing, and keywords. Today *AATA*, produced by the Documentation Program of the GCI and published twice a year, is a database publication with computerized data management. Institute staff, assisted by over 80 international volunteers, compile and edit approximately 3,500 abstracts a year.

In another important effort, *AATA* and the International Centre for the Study of the Preservation and the Restoration of Cultural Property (ICCRROM) decided in 1985 to pool bibliographic references in a common on-line

database. Shortly thereafter the Canadian Heritage Information Network (CHIN), a program of the National Museums of Canada, agreed to undertake a pilot project to create an on-line database for *AATA*. The Canadian Conservation Institute (CCI), a sister program to CHIN, became a key partner in this emerging network.

The Conservation Information Network (CIN) was officially released in September 1987. An important feature of the Network was that it allowed conservation professionals to conduct electronic dialogues with colleagues around the world. In 1990 the GCI began transferring responsibility for the network to CHIN, which today handles its operation. Recent technological advances in communications, including Internet access, have the potential for widening dissemination of CIN.

A third important effort in information exchange and advocacy has been in disaster preparedness. Because of the threat disasters pose to cultural heritage preservation, the GCI has been active in disaster preparedness and response. In 1985 it organized a meeting of international and U.S. agencies and museums to identify needs and to encourage communication between disaster planning organizations and cultural institutions. That meeting led to the creation of a steering committee that over the next three years pursued these objectives. Since 1985 the GCI—whose activities in disaster preparedness have included scientific research, training, publications, and emergency response missions—has helped organize other gatherings. These included a 1992 emergency planning workshop for museum directors and a 1993 international colloquium in Quito, Ecuador, on the seismic stabilization of historic buildings. Other conferences included one in 1990, on disaster response at the Library of the then-Soviet Academy of Sciences in St. Petersburg, and one in 1993 in Cairo, on Islamic monuments damaged by Egypt's 1992 earthquake.

Throughout its first decade the GCI has worked closely with the Federal Emergency Management Agency (FEMA) and others to put cultural heritage preservation on the national disaster response agenda. As the result of a 1994 conference organized by the GCI, FEMA, and the National Institute for the Conservation of Cultural Property, a national task force on emergency response is now at work on a number of initiatives to assist cultural institutions to prepare for and cope with disasters.

—Jeffrey Levin



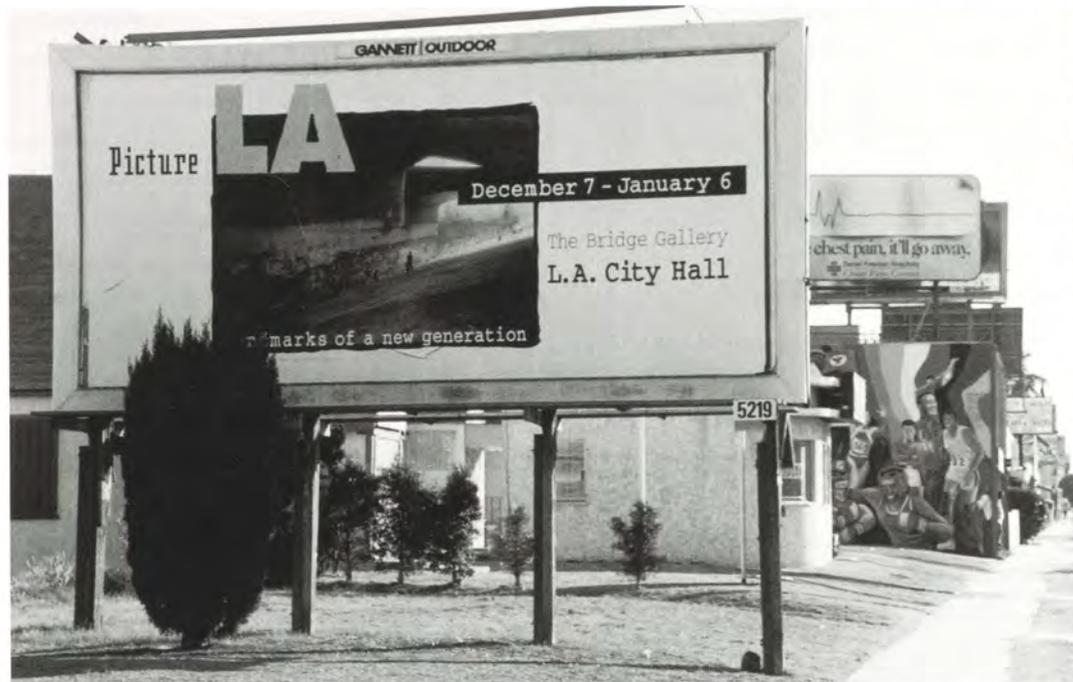
Getty Museum staff during a 1990 emergency preparedness drill. The GCI has worked with the Museum and many other cultural organizations to improve disaster preparedness.
Photo: Courtesy The J. Paul Getty Museum.

Exhibitions

THE SIGHT OF A RUIN LYING IN THE WILDERNESS or an object illuminated in a museum can inspire awe and appreciation for things beautiful and magnificent. But ignorance about an artifact's life history can leave us with a sense of detachment. While we may appreciate the art, we may not necessarily appreciate the artifice that went into its making or the ways to prevent its decay. This lack of awareness may turn many of us into "consumers" and cultural heritage into a disposable commodity. Educated in conservation's importance, we could—and some of us would—help preserve the legacy inherited from the past for future generations.

Exhibitions with a theme of preservation are an effective means of raising such awareness. Whereas traditional museum exhibitions have helped broaden art appreciation and attracted individuals and institutions to benefit their cause, innovative exhibitions geared toward conservation can expand the learning horizon and bring more resources to bear on the care of culture.

The GCI's first field project was the subject of a GCI-Getty Museum exhibition during the winter of 1992 and 1993. *In the Tomb of Nefertari: Conservation of the Wall Paintings* documented a six-year effort by the GCI and the Egyptian Antiquities Organization to conserve the 3,200-year-old wall paintings of Queen Nefertari's tomb in Upper Egypt. The exhibit included some 40 objects lent by U.S. museums, a life-size photographic replica of one of the tomb's most beautiful chambers, and panels illustrating the problems facing the conservators and the solutions they devised.



Below: Billboard in Los Angeles publicizing the *Picture L.A.* exhibit. Photo: Ron Mesaros.
Right: Street banner in Rome announcing the Nefertari exhibition. Photo: Guillermo Aldana.

Encouraged by the exhibition's success, the GCI and the Fondazione Memmo, a nonprofit foundation, mounted *Nefertari: Luce d'Egitto* at the Palazzo Ruspoli in Rome from October 1994 to June 1995. Seen by nearly half a million visitors, the exhibition provided a context for the wall paintings through the display of more than 130 objects and didactic materials and artifacts explaining the techniques used both by the ancient Egyptian artisans and by the GCI conservators. An interactive virtual reality gallery allowed visitors to walk through the tomb as it appears today as well as at the time of its discovery in 1904; to learn the meaning of its images and inscriptions; and to gain awareness of deterioration problems and treatment methods. The virtual reality program has been demonstrated at

numerous multimedia conferences and was installed at Epcot Center in Florida in December 1995. The Nefertari exhibition moved to the Promotrice delle Belle Arti in Turin at the same time and will remain on display until March 1996.

A GCI exhibition of a different kind opened at the Los Angeles City Hall in December 1994. *Picture L.A.: Landmarks of a New Generation* was a GCI public awareness initiative to draw attention among young people—especially urban youth—to the vital role played by cultural heritage in shaping personal and group identities. It displayed photographs taken by a group of eight participants—ranging in age from 10 to 18—from different communities in the city; they recorded the landmarks of



their personal lives and neighborhoods as well as public heritage sites. The project generated enormous excitement among the young photographers who responded eagerly to the opportunity to express their views. Some went on to win awards, grants, college placement, and jobs related to the new skills they had learned.

Picture L.A. has traveled to other venues in Los Angeles and Chicago and is on public display at the Vice President's residence in Washington, D.C. A number of schools and community organizations have initiated similar projects, and plans are under way to duplicate the project in five other cities around the world.

The GCI is committed to pursuing a vigorous program of public awareness initiatives in the future. It is hoped that these activities will build alliances with the public and help create a new generation that identifies itself as a custodian of our common cultural heritage.

—Mahasti Afshar

Documentaries and Multimedia Productions

THE FIRST GETTY CONSERVATION INSTITUTE field project—the conservation of the wall paintings of the tomb of Nefertari—was also the subject of the first video documentary on the GCI. Produced by the BBC in 1987 and titled *Chronicle: Queen Nefertari*, this one-hour documentary captured the delicate and painstaking work carried out during the initial stages of the six-year conservation program, in particular, the conservation team's first campaign to stabilize the areas of the wall paintings needing emergency treatment.

The popularity of the Nefertari documentary, which continues to air on television channels worldwide, is proof of the power of this medium to educate the nonspecialist in a direct and entertaining way. A short version of the video, shown at the Nefertari exhibitions coorganized by the GCI at the J. Paul Getty Museum (1992–1993) and at the Palazzo Ruspoli in Rome (1994–1995), proved an effective didactic tool in an exhibition setting.

The success of the BBC video prompted the GCI to initiate a second Nefertari documentary in 1992, following the completion of the conservation and cleaning of the tomb's wall paintings. Produced by Televisa in association with the GCI, *Nefertari: The Search for Eternal Life* is a half-hour program that complements the earlier video by showing the brilliant colors and artistry of the ancient Egyptians revealed by the conservation of the wall paintings.

Quito at the Crossroads: Saving the Historic Capital of Ecuador is a half-hour video produced in 1994 as a public awareness component of a GCI field project. As with preservation work in other historic city centers, the effort in Quito necessitates participation by both specialists and the public. The video's chief objective was to help local authorities communicate to the general populace and the private sector the problems and opportunities inherent in the revitalization of Quito's magnificent but deteriorating



Video crew, using a makeshift dolly, videotaping for a GCI documentary on the bas-reliefs of the Royal Palaces of Abomey. Photo: © Pedro Pablo Celedón.

War and Greed: Threats to Cultural Heritage

colonial center. Thus, in addition to the preservation of the physical fabric of monuments, the video addresses the maintenance, renovation, and reuse of old buildings to accommodate modern-day needs; control of traffic and pollution; upgrading of public utilities and sanitation; management of street vending, as well as retail and warehousing establishments; and development of an infrastructure for cultural tourism.

Two other GCI documentaries are currently in production, both focusing on GCI projects. One documents the effort to preserve the bas-reliefs of the Royal Palaces of Abomey, Benin. The other features the conservation of *The Last Judgment* mosaic on St. Vitus Cathedral in Prague.

The GCI is also developing several CD-ROM projects, both for the conservation professional and the general public. The audiovisual data from GCI videos and CD-ROMs are periodically edited for inclusion in a digital multimedia program entitled *Where in the World is the GCI?*, originally produced in 1993. Plans are under way to format this program into an interactive kiosk where users can navigate themselves through the network of GCI activities. This and other multimedia productions will be used by the GCI to help the public discover the fascinating world where diverse disciplines and interests converge to safeguard our cultural heritage.

—Mahasti Afshar

THE LOSS OF CULTURAL HERITAGE cannot always be ascribed to natural forces or to human negligence. Sometimes what is at work is more overt or intentional. Because cultural heritage embodies the aspirations, beliefs, achievements, and history of communities, it can become a pawn when peoples clash in armed conflict, destroyed as a way to demoralize and defeat. Even when cultural objects or places of significance are not specifically targeted for destruction, they can be victims of war, damaged or obliterated because they stood in the way of some military objective.

Cultural heritage is also threatened by greed. Illicit trafficking in art and artifacts is a worldwide and continuing problem, fueled in part by wealth (collectors willing to pay for items regardless of how they were obtained), unscrupulousness (dealers eager to profit from this market), and poverty (poor people who derive their livelihood from looting archaeological sites). Vast amounts of cultural patrimony have disappeared from their nations of origin as the result of these interlinked and all-too-human factors.

These threats to cultural heritage are particularly troubling because human action is the cause. For that reason, the Getty Conservation Institute has engaged in several efforts to bring about greater awareness of these issues, in the hope that those within and beyond the conservation community will be moved to respond.

At the 1992 spring meeting of the Materials Research Society, the Institute coorganized a five-day symposium that included a session on the protection and loss of cultural heritage during warfare. Papers presented at the session offered perspectives on the protection of art and structures during historic and recent conflicts, including the Gulf War and the war in Croatia. The GCI presented a paper offering suggestions for strengthening the 1954 UNESCO Convention for the Protection of Cultural Property in the Event of Armed Conflict.



A building in Croatia, destroyed during warfare in fall 1991.
Photo: Courtesy of Radovan Ivancevic.

In 1993 the Institute provided financial support for an International Council of Museums (ICOM) mission to the Republic of Croatia to survey war damage to Croatian museums, galleries, and collections. The mission's report was published by the Council of Europe in 1994 and its findings subsequently summarized in this newsletter. A similar mission, also supported by the GCI, was undertaken in Lebanon in fall 1994. The mission surveyed conditions at a number of the country's important archaeological sites and reported on the status of the National Museum in Beirut, which was badly damaged during the civil war. Both of these efforts documented the significant loss of cultural heritage as another casualty of brutal conflicts.

The problem of cultural heritage theft and illicit trafficking was addressed as part of a major conference on cultural heritage in Asia and the Pacific, coorganized by the Institute in Hawaii in 1991. The subject was again discussed at some length in a GCI-organized follow-up meeting two years later in Sri Lanka. These gatherings are part of the Institute's efforts to create networks of professionals who can regularly exchange ideas on how to respond to the continuing threats to cultural heritage.

—Jeffrey Levin

The following individuals contributed the articles
in this special issue of *Conservation*:

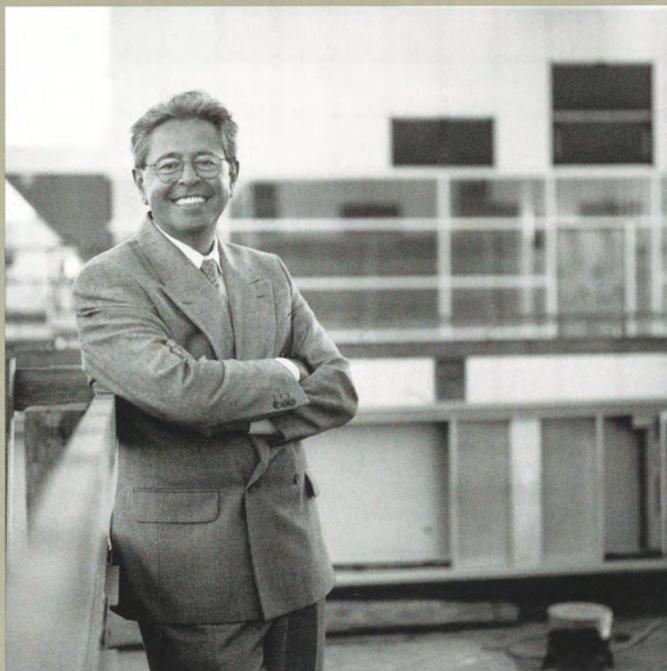
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PRESERVING
CULTURAL HERITAGE
IN THE
INFORMATION AGE

A CONVERSATION WITH

*Miguel Angel
Corzo*

Dennis Keeley



Miguel Angel Corzo has been Director of the Getty Conservation Institute since 1991. Prior to his appointment, he was President and Chief Executive Officer of the Friends of the Arts of Mexico Foundation, where he organized *Mexico: Splendor of Thirty Centuries*, one of the three most successful museum exhibitions in U.S. history. He earlier served as the GCI's Director of Special Projects. He is a member of the Conservation Committee of the International Council of Museums and in 1995 was appointed by President Clinton to the Cultural Property Advisory Committee.

He spoke with Jeffrey Levin, the Editor of *Conservation, The GCI Newsletter*.

■ *Jeffrey Levin: The GCI's basic mission is the preservation of cultural heritage.*

Why does preserving our cultural heritage matter? Why should we put resources into it? Why should we care?

■ Miguel Angel Corzo: This is a question not only for conservation but also for the arts and culture. And it's a question for many countries, because we all are beginning to recognize the difficult choices we have to make in terms of what we can spend on our social environment.

I believe that the arts and humanities are an essential part of life. They provide a sense of identity, of belonging, of integration with the spirit. They really are the food of the soul. You can't stop feeding the soul if you want to survive.

Culture and the arts are inherent to humankind. The ability and the inclination to create are the essence of what distinguishes human beings from the other species. There are no countries, and there are no people, who have not in one way or another tried to transcend the basic problems of survival and enter into another realm. Survival was pretty basic for our ancestors of 17,000 years ago, but even then, they were painting pictures on cave walls at Lascaux. Preservation of the cultural heritage is necessary for the survival of the spirit.

How do you think the issues in conservation have changed during the GCI's first 10 years of operation?

In terms of conservation itself, the issues are very similar. We're still dealing with the deterioration of materials—and materials continue to decay much as they did 10 years ago. Perhaps the real change is in a clearer recognition of the fragility of our cultural heritage and how it is threatened not only by the forces of nature but, to a large extent, by the actions of people. At the same time, conservation is now taking on new dimensions, utilizing tools such as management and marketing, which had not been used to the extent that they're being used now. That's a big change.

The other change is one of perception by the general public about what we preserve and the importance of preservation itself. We've broadened what we define as our cultural heritage and changed what we value.

What do you think has prompted that change in perception?

Well, in part, this incredible movement of collecting everything. There wasn't as much interest in conservation until collecting just took off. Now people have been collecting for years—stamps, photographs, textiles—and they're seeing their collections deteriorate. People are asking how they can preserve their personal heritage: their photographs, letters, embroideries, and other family treasures. I think a concern about preserving the family heritage has helped change perceptions about conservation's importance. The need to maintain our diverse cultural identities is also a driving force of conservation.

What about negative developments? Are there problems that are greater now than they were 10 years ago?

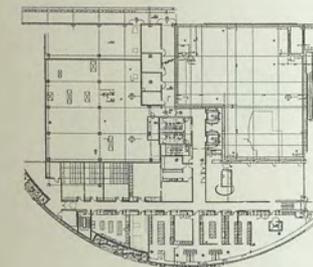
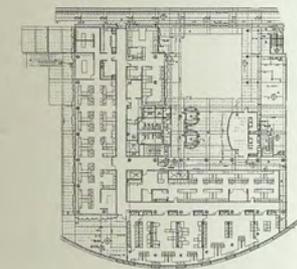
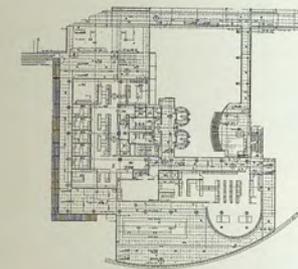
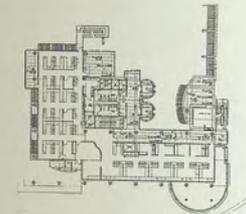
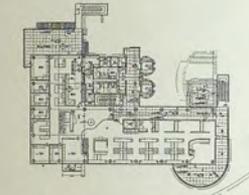
I would say yes. Pollution has increased, desertification continues to happen, unplanned development goes on, and the onslaught of mass tourism continues to destroy things. Contemporary society—the way we live, work, travel, and exploit the environment—is creating problems that can have terrible consequences for cultural heritage.

Will the issues in conservation be any different 10 years from now?

I don't know that the issues will be different, but the way we look at them will be different. The world is going through a big transformation in every aspect of life. We've gone from an agricultural to an industrial to an informational society. What we now understand is that information and knowledge have a value as a service—and that's changing the course of conservation. This new access to information means that we have whole new ways of looking at and thinking about a problem in conservation.

Why is public awareness of conservation important? Why isn't it enough for the specialists like the GCI to just do the work?

Because we live in a world of information. There is a tremendous amount of information being produced and disseminated—and it's competing with other information. If you only get one type of information, you won't be getting the total picture. People have to make choices about what matters in their lives, and if their choices are guided by information that doesn't recognize the value of their cultural heritage, then most likely the preservation of that heritage will be neglected. If no one hears about conservation of cultural heritage, it may become something that falls by the wayside in the decision-making process.



So conservation can't be done without the public, because ultimately the public makes the choice about where its resources go—what gets saved and what doesn't.

Sure. And the choices keep getting harder.

That raises another question. How do communities and nations go about making the difficult choices of what will be saved and what will be allowed to vanish?

Up to now, a lot of the choices have been delegated to the experts. But that's only a partial answer, because the experts have to base the choices on what society values. Society cannot reach an honest conclusion about what it values if it's not informed. That's why it's necessary to bring to society a dialogue about what we value in order to make the difficult choices about what we should conserve. And it really should be a dialogue among many elements of society, not only the experts. Poets and philosophers, painters and factory workers, computer specialists, managers, professionals, and everyone else—from schoolchildren to senior citizens—should be involved in the choice. Otherwise, things are left to random forces, such as war or time.

It's a paradox of contemporary life that while we have the capacity to preserve for the future what we really value in our society, we may fail to do it. At this moment we are saving mountains of records in paper form and optical disks of trillions of things, because we feel those are very important. Are these the things we're going to bequeath to future generations? CDs and warehouses of paper? Is that going to be our grand statement on the 20th century to the future? I certainly hope not, but we're fast approaching that.

Top: The Getty Center building that will become the GCI's new home in May 1996. Photo: Vladimir Lange. Right: Floor plans for the Institute.

So the first step in conservation generally should be a discussion about values.

Yes. We first need to figure out what we really value collectively, and then make decisions about what we preserve on the basis of what we value. Dialogue is important, because everybody should help make those decisions. I, for instance, would love to bring the decision-making process to a third-grade class and let the children decide what they would save, say, in the choice between an object which could be of their own or an object which could be of their community or their world. It would be fascinating. In a sense that's what we did with our *Picture L.A.* project—giving a group of young people cameras and asking them to photograph the landmarks they value in their community. What they came up with was, I think, a shock to everybody.

What does the conservation community itself need to do to increase public awareness of conservation and its importance?

Members of the conservation community—conservators, conservation scientists, museum curators, site managers, and others connected to the field—should start talking to audiences outside their professional circle. It's not enough to reach out to groups already convinced of conservation's importance. We need to be convincing the unconvinced or the uninformed. And I think we can.

People in conservation are fascinated by the work that they do. And they must be, otherwise they wouldn't be doing it. Well, isn't it important to transmit to others the knowledge and the passion that they bring to their work? Whenever I've seen a layperson look at people doing conservation, I have seen nothing but awe and admiration for their skill and ability. Why not make that more public?

I also think that the conservation community has to convey to the public that our efforts are not simply aimed at mending objects but also at rescuing information from loss. The value of our cultural heritage goes far beyond its aesthetic virtues. It's a repository of information about who we are and what we've achieved. It's that information, as much as anything, that we're trying to preserve. If we are able to communicate that to the rest of the world, then in this world of information, there can be a new understanding of what we do and why conservation is important.

The GCI is one program of seven that make up the Getty Trust. In May it's moving to the new Getty Center here in Los Angeles, and over the course of a year it will be joined by the other entities of the Trust. How will this move enhance what the Institute does? Do you see the GCI working more closely with the other programs once they are all gathered together at the Center?

Absolutely. It's already happening. Perhaps the most recent example of collaboration is last May's Mediterranean conference on preserving archaeological sites, which we coorganized with the Getty Museum. Being together at the Getty Center will mean the greater possibility of chance encounters that can lead to the creation of more collaborative projects. It will also mean more discussions with our colleagues that will help us look at conservation issues from different points of view. Although we may not have full-fledged collaborative

ventures in everything we do, certainly there will be more influencing of one another. Of course, because of the impending move, the Getty programs are already beginning to plan more collaborative activities.

What kinds of things?

Well, for instance, we are collaborating with the Center for the History of Art and the Humanities on a series of lectures and seminars. We are planning joint exhibitions with the Museum, and we are working with the Center for Education in the Arts on ways of disseminating more information about conservation. These things are already in the works.

Are there linkages with outside organizations and institutions that conservation as a field—and the GCI in particular—needs to make?

We're exploring that all the time. We are, for example, trying to use a lot of the research in materials science utilized by industry to figure out better ways of solving conservation problems. We're meeting with organizations that deal with tourism to convey to them a different message about conservation—and I believe we have made great inroads there. We are talking now to management organizations, because conservation management is a whole new field. So other kinds of enterprises—like aerospace, tourism, or management—that traditionally had nothing to do with conservation have become linked to conservation in various ways in the last 10 years.

Ten years from now what would you like to see different at the Institute—and what would you like to see the same?

I would like to see the same exceptional intellectual quality and high level of dedication and discipline that the staff currently has. I'm sure those things will remain. What I hope to see change is the way that we go about bringing the message of conservation to the professions, as well as to the outside world. We have to become an institution that shows new paths for providing information. Much of what we do—and will continue to do—involves training, research, documentation, and special projects. But running as a theme through all of these is the importance of information. In a variety of ways, we are an information organization. We process information, and we add value to information before passing it on. The knowledge we have is a valuable commodity which has to be transmitted in some manner or another, and we have to find better mechanisms to do that.

I think that in 10 years' time, we will be adding value to information and disseminating information in ways that create a better understanding of the processes of conservation, and that make conservation more accessible to larger numbers of people. That is the way we're going to be able to preserve what we cherish.



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