CONSERVATION PERSPECTIVES

THE GCI NEWSLETTER

FALL 2013

HERITAGE INVENTORIES

The Getty Conservation Institute

A Note from the Director

In the conservation of cultural heritage, certain principles endure. Among them is the precept that knowing what you have is critical to keeping it. A thorough knowledge of the nature and extent of one's cultural heritage resources is the first step in the preservation of those resources. Of course the methods for doing this inevitably change, as new (and one hopes better) technologies are developed for recording and documenting cultural heritage and for managing that information. But what does not change is the principle that the more you know about what you have, the better positioned you are to protect and care for it—which makes cultural heritage inventories one of the most critical tools for cultural heritage management.

In this edition of *Conservation Perspectives*, we consider this proposition. The articles not only examine the importance of inventories in a variety of circumstances—from urban development to armed conflict to natural disasters—but also discuss a major undertaking by the GCI and World Monuments Fund (WMF) to develop Arches, a new information system for the international heritage field specifically designed to create and manage heritage inventories. In the feature article, members of the GCI-WMF team overseeing the system's development—David Myers, Yiannis Avramides, and Alison Dalgity—describe this open source geospatial web application, available at no cost, which incorporates internationally adopted inventory standards and enhances the ability of organizations to preserve their heritage resources.

The accompanying articles make it clear that heritage inventories are essential for cultural resources protection. David Logan and Richard Mackay explain how heritage inventories in Australia have provided legal protection for heritage resources and guidance about permissible or desirable change, thus supporting good decision making. In his article on armed conflict, Peter Stone draws on his own experience to make the case for more national and international efforts to produce national heritage lists in a standard, internationally sanctioned format, well before potential conflicts become real threats. Deidre McCarthy describes how efforts to protect heritage resources in the aftermath of recent natural disasters—in particular, Hurricane Katrina—underscore the significant role heritage inventories can play in the preparation for and response to such disasters. And in our newsletter roundtable, Gillian Grayson, Janet Hansen, and Daniele Pini draw upon their diverse experience, ranging from the United States to Europe to the Middle East, to discuss the challenges of creating heritage inventories and to provide insights into their value. I hope that this edition of *Conservation Perspectives* will advance the development and use of these crucial tools in the preservation of the cultural heritage.

Timothy P. Whalen

CONSERVATION PERSPECTIVES

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ON THE COVER
Satellite view of Avebury, a World Heritage Site in England, showing the
village encircled by the prehistoric henge. Image: © 2013 Google Map Data.

CHANGING THE HERITAGE

The Arches Open Source System

BY DAVID MYERS, YIANNIS AVRAMIDES, AND ALISON DALGITY

Whether to help guide construction of a highway or gas pipeline, evaluate the condition of cultural heritage in the aftermath of a natural disaster, or determine if a demolition permit should be issued for a significant building, inventories are a necessary tool for heritage management. They inform authorities, scholars, and the public of essential information about heritage resources including their size, location, and significance. They also enable comparison of sites, aiding in categorization, appraisal of authenticity and integrity, and determination of relative significance—assessments that can assist in prioritizing management interventions. Legislation in many jurisdictions mandates the use of inventories as a means of heritage protection. In addition to their role in public administration, inventories are valuable for research, heritage tourism, and general public interpretation and understanding, because they organize information about cultural heritage.

In recent decades, the development of new digital information technologies, particularly geographic information systems (GIS), has substantially improved the effectiveness of heritage inventories. Rapidly growing global access to the Internet has

Aerial view of Ghent, capital of East Flanders in Belgium. Early in the development of Arches, the Flanders Heritage Agency provided test data and valuable advice on a number of development issues. Photo: Edelseider, courtesy Wikimedia, licensed under the Creative Commons Attribution–Share Alike 3.0 Unported license.

INVENTORY PARADIGM

made possible broadly accessible, web-based information systems for the inventory and management of immovable heritage. However, the development of an effective system can be a costly and substantial undertaking well beyond the reach of many heritage agencies.

To address this challenge, the Getty Conservation Institute (GCI) and World Monuments Fund (WMF) partnered to develop for the international heritage field a modern information system specifically designed to create and manage heritage inventories. A major result of this partnership is the just-released version 1.0 of Arches, a new open source geospatial web application for cultural heritage inventory and management, which allows organizations to view, create, edit, and query data.[1] As an open source product, the Arches software is available at no cost, and individual users may modify it to meet their specific needs. Incorporating internationally adopted inventory standards, Arches will give heritage organizations most of what they require to create high-quality inventory and management systems.

BACKGROUND AND RATIONALE

In 2004, a year after the invasion of Iraq, the GCI and WMF formed the Iraq Cultural Heritage Conservation Initiative to support the Iraq State Board of Antiquities and Heritage (SBAH) in its role as national steward of Iraq's wealth of archaeological and architectural heritage. One component of the initiative was to create a national heritage information system for the SBAH to help it protect Iraq's heritage from looting, development, and other threats. Unfortunately, the political and security conditions in Iraq in the years following the invasion made progress slow and intermittent.

To overcome these difficulties, the GCI and WMF collaborated with the Jordanian Department of Antiquities to establish a similar system in Jordan with the aim of adapting that system for use in Iraq when the situation there improved. In June 2010, the GCI and WMF completed development of the Middle Eastern Geodatabase for Antiquities (MEGA)-Jordan—a web-based, bilingual (Arabic and English), geospatial information system designed to serve as an archaeological site inventory and management system for the Department of Antiquities of Jordan. The system was deployed nationwide in December 2010 and remains in use. The Department of Antiquities has allowed public access to the system for viewing and searching purposes at www.megajordan.org.

In April 2011, the GCI and WMF made available to the Iraq SBAH a prototype of MEGA-Iraq for inventory and management of archaeological sites. The GCI and WMF planned to expand the capabilities of MEGA-Iraq to document other types of immovable heritage, but this work has been delayed by the situation in Iraq.

In the process of creating MEGA, the GCI and WMF quickly discovered that the options available to heritage agencies for creating and managing inventories left much to be desired. Proprietary software rarely fits the needs of the heritage field. Therefore, cultural heritage organizations are spending precious resources to create custom information systems from scratch, in addition to committing to high-priced proprietary software licenses and upgrades. The use of proprietary and nonstandard data formats often leads to the inability to combine or compare datasets or share data with other systems, frequently because of obsolescence. As a result, organizations often struggle to make the best use of the data they have amassed.

The successful deployment of MEGA in Jordan prompted many institutions worldwide to express interest in using a customized version of that system for their own inventories. Based on the needs observed and the interest expressed, the GCI and WMF decided to pool resources to create a purpose-built information system that would be ready for organizations to download, customize, and deploy independently. Arches is intended to reduce the necessity for heritage institutions to spend scarce resources on creating systems from the ground up, and also to alleviate the need for them to engage the complex and constantly changing world of software development.

SYSTEM DEVELOPMENT

In the summer of 2011, the GCI and WMF began work on Arches as an open source system. To develop Arches, the GCI and WMF selected Farallon Geographics, which had proven its
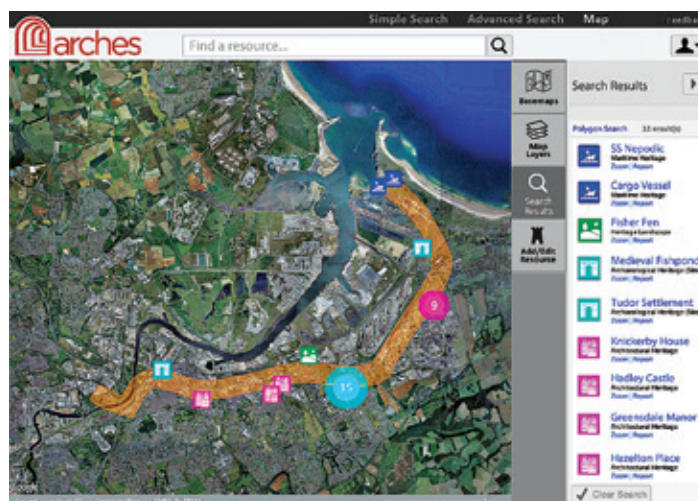
This screen shot of Arches depicts a user–defined polygon search for heritage resources in the area of a simulated construction project. Heritage resources within the polygon that would be impacted appear as icons. When many heritage assets are in close proximity in a map view, a cluster icon appears and displays the number of heritage assets that cluster represents. Image: © 2013 Google Map Data.

The Roman ruins at Jarash in Jordan, with the modern city looming in the background. The Arches system grew out of GCI–WMF development of MEGA–Jordan—a geospatial information system designed to serve as an archaeological site inventory and management system for Jordan's Department of Antiquities. Photo: © Samer Muscati.

expertise and had worked effectively with the GCI-WMF team during the development of MEGA. The first step was to define the requirements of a generic system that would support the needs of heritage organizations internationally to create and maintain inventories of heritage resources and would help manage them. The GCI and WMF consulted international best practices and standards, engaging nearly twenty national, regional, and local government heritage authorities from the United States, England, Belgium, France, and several Middle Eastern countries, as well as American and European information technology experts.

As a result of these efforts—and from lessons learned during the development of MEGA—the project team determined that Arches should serve several purposes fundamental to the understanding, appreciation, and protection of heritage places, including identification and inventory, research, condition assessment, determination of management priorities, and raising of public awareness of these resources.

SYSTEM DESIGN AND FUNCTIONALITY

Overriding principles for the design of Arches include:

- *Standards-based:* Arches incorporates internationally adopted standards for heritage inventories, as well as international standards for heritage data and information technology, to promote data sharing and longevity regardless of technological advances.
- *Accessible:* Web-based to allow broad access, Arches is designed to be user friendly and purposely avoids complex analytic tools in favor of an easy-to-learn user interface.
- *Customizable:* The system's code is open and is capable of being configured and extended to meet the particular needs of adopters.
- *Economical:* Released under an open source license, Arches is available at no cost, and adopters may pool resources to pay for customizations and maintenance.

Based on the requirements gathered, the project team specified the features that the core version of Arches would need to contain. Because it was developed to serve a variety of organizations with different needs, it was designed to maximize flexibility. For example, adopters may control the degree of data privacy that their system contains. Arches will allow each organization deploying it to implement an individual information access policy; organizations may choose to have their systems and data open to online access or to limit data accessibility. The system does enforce and promote the standardization of data through validation and controlled vocabularies, including thesauri.

Data within Arches are structured into four primary theme

categories. *Heritage Resources* includes all types of immovable heritage, such as archaeological, architectural, landscape, urban, and maritime heritage. *Activities* comprises historical events as well as contemporary activities, such as those related to investigation, designation and protection, and management. *Actors* includes persons as well as organizations, both historical and contemporary, and *Documents* contains all types of documents and images. Arches manages relationships among data organized under these themes, so that a particular *Actor* (for instance, Mahatma Gandhi) may be related to multiple *Activities* (for example, historical events such as political protests), *Heritage Resources* (such as protest sites, judicial courts, and prisons), and *Documents* (such as letters written by Gandhi). This structure can aid in the discovery of previously unknown relationships among people, places, events, and documents, which can, in turn, lead to new knowledge.

HERITAGE INVENTORY STANDARDS

Growing out of documentation practices in a number of countries, international standards have been developed for the inventory of archaeological, architectural, and movable cultural heritage. These standards identify "core," or essential, items of information that should be part of any cultural heritage inventory. These standards were also created to facilitate data sharing across political boundaries and to serve as a reference for heritage organizations, which, as they create inventories, often grapple with identifying the optimal set of inventory data to meet the practical requirements of heritage stewardship. One standard for inventory of architectural heritage, the *Core Data Index to Historic Buildings*

and Monuments of the Architectural Heritage, was adopted by the Council of Europe in 1992. A second standard for inventory of archaeological heritage, the *Core Data Standard for Archaeological Sites and Monuments*, was adopted by the International Committee for Documentation (CIDOC) of the International Council of Museums in 1995.

CIDOC is now finalizing a combined standard for the inventory of both archaeological and architectural heritage known as the *International Core Data Standard for Archaeological and Architectural Heritage*. For the Arches system, this combined standard was used to identify the data fields of version 1.0. Organizations that deploy Arches can customize those data fields to meet their specific requirements.

HERITAGE DATA STANDARDS

A widespread problem with heritage data over the long term is that data loses its meaning if it was inadequately documented and the individuals who originally understood it are no longer available. To encode and preserve the meaning of information managed by the software, Arches uses the CIDOC Conceptual Reference Model (CRM), adopted by the International Organization for Standardization (ISO); this model is a carefully constructed ontology that defines the possible relationships among heritage concepts.[2] Use of the CRM keeps the data independent of conventions that are particular to the design of Arches. It also contributes to powerfully effective searches within, as well as across, data sets. It will facilitate data migration to newer systems and aid in the preservation of data over time.

The integration of the CRM into Arches reflects one of

A GCI–WMF open source community workshop on Arches in England in June 2013. Twenty heritage professionals from government agencies and academic institutions in Britain and Europe worked with the project team to provide feedback in advance of release of version 1.0 of the system. Photo: Martin Newman.

the most exciting recent developments in information technology—namely, semantic awareness and the potential to publish and disseminate information as linked open data (LOD).[3] This is a significant achievement because it allows heritage agencies and others to share data and establish new relationships among that data. For example, a historian somewhere in the world might document the birthplace of an artist, which happens to be a building now under the jurisdiction of a local heritage agency elsewhere in the world. If the heritage agency is unaware of this connection, a search using LOD will yield the new information from the historian, and this knowledge may help to justify the building's legal protection by the agency. Because of this kind of capability, there is growing interest on the part of libraries, museums, and archives in publishing structured data as LOD. Arches will greatly facilitate the publication of data on immovable cultural heritage in this format.

INFORMATION TECHNOLOGY COMPONENTS AND STANDARDS

Arches has been developed with several modern open source components. The application employs open data standards[4] and is designed to access and process geospatial data based on the standards and specifications published by the Open Geospatial Consortium (OGC). Compliance with OGC standards makes Arches compatible with desktop GIS applications widely used in the heritage sector, including Esri ArcGIS, Google Earth, and Quantum GIS, as well as with common web browsers and online satellite imagery and map services (e.g., OpenStreetMap, Google, and Microsoft). Arches implements application programming interfaces (APIs) providing modern and standards-based methods for integrating multiple information management systems.

SYSTEM RELEASE AND THE CREATION OF COMMUNITY

Version 1.0 of the software was completed and released in September 2013, and it is freely available for download from www.archesproject.org. This core version was unveiled during the 2013 symposium of the ICOMOS International Committee for Documentation of Cultural Heritage (CIPA) in Strasbourg, France, and discussed in an information session and a keynote presentation. An evolving software road map lists and prioritizes many additional features that the Arches open source community may now create to enhance the core version. These features include more advanced options to import and export data and to interact with other systems, and a mobile app for use in field data collection.

Arches was designed as a common platform for heritage data management that is easy to customize and extend depending on users' existing or future needs. To meet this ambitious goal, it was important to create and nurture an environment of ongoing collaboration by a diverse community of heritage organizations and professionals, as well as IT specialists. During the development of version 1.0 of Arches, the contributions of heritage institutions played a critical role. Early on, the Flanders Heritage Agency gave test data and valuable advice on a number of development issues. English Heritage contributed substantially by providing additional data for system development, testing, and demonstration, by offering guidance on controlled vocabularies and the incorporation of the CIDOC CRM, and by leading the system documentation effort.

The community is open to everyone and can include a wide range of individuals with varied interests, expertise, and skills.[5] Computer programmers may decide to try solving existing issues, or bugs, that have been posted publicly for review and resolution; others may prefer to create or participate in conversations about Arches; yet others may choose to help update the user manual, translate the user interface, or answer newcomers' questions. Many participants are drawn from organizations that have direct need for the software and interest in seeing it updated and maintained. It is hoped that as the software gains adopters, development will become increasingly robust and collaborative. Under the open source license, any improvements must be made available to everyone. The success of the open source community is a key factor for the success of this initiative, and the GCI and WMF are committed to providing resources to assist the community during the first years of its existence. Ultimately, it is the community's dedication to the evolving vision of Arches that will help it thrive and guarantee its long-term sustainability.

Work on the first implementation of Arches has already begun. In parallel to the development of the core version of Arches for the international heritage field, the GCI began customizing the system for the City of Los Angeles. For several years the GCI has offered technical advice—and the Getty Foundation has provided financial support—to an ongoing citywide survey of historic resources in Los Angeles called SurveyLA (an effort that grew out of an earlier GCI assessment of the city's need for a survey). Arches will be used to manage the records of the hundreds of thousands of properties documented through SurveyLA and to publish them online so that they are publicly accessible. Once implemented, it will serve as a tool for the city to help manage historic resources and as an aid to scholars and the public conducting research on the Los Angeles historic environment.

THE POTENTIAL AND THE ROAD AHEAD

Arches represents a groundbreaking effort to create for the cultural heritage field a purpose-built system incorporating the latest information technologies in data structuring, geospatial software, and semantics. It is hoped that Arches will help break the cycle of heritage organizations independently expending scarce funds to create their own custom-made systems from scratch—a

Historic Broadway in downtown Los Angeles. In parallel to the development of the core version of Arches, the GCI began customizing the system for the City of Los Angeles, where it will serve as a tool for the city to help manage historic resources. Photo: Emile Askey, GCI.

pattern that has long characterized the heritage field. To that end, the GCI and WMF have invested substantial resources in the development of a standards-based, ready-to-use system that will preclude multiple expenditures addressing identical needs.

Arches has the potential to become the profession's standard for the inventory of immovable heritage, with multiplying benefits for the entire field. Using Arches provides a way for organizations to benefit from customizations, upgrades, improvements, and maintenance undertaken by anyone within the community. The careful integration of standards into Arches encourages the creation and management of data using best practices. This capacity, in turn, facilitates the exchange and comparison of data among Arches and other information systems, within both the heritage community and related fields, and it will ultimately support the longevity of data.

Technology advances relentlessly, and Arches must evolve through the support of the community or eventually become obsolete. However, it is most important that the heritage field address the challenge of ensuring that the body of knowledge painstakingly assembled in information systems over many decades is well protected and continues to advance heritage management and protection into the future.

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1. Open source refers to a computer program made available free of charge to the general public with its source programming code open—which means its original design may be modified. Customizations, upgrades, or improvements made to the software by anyone must remain freely available.

2. In information science, an ontology is a framework for organizing information. It lists concepts within a field of study and the possible relationships among those concepts. Data mapped to an ontology are more clearly understood by machines, and relationships or links among information items and groups can be inferred automatically. Using an ontology also helps protect data from becoming inaccessible and obsolete, because the data are more precisely described.

3. Linked open data is a method of using the web to expose, share, and connect openly available data. LOD enables data from different sources to be connected (linked) and queried. An ontology (see note 2) must be used to prepare data to be published as linked open data.

4. Open data standards ensure compatibility among diverse data sets.

5. For more information about how successful open source communities function, see Karl Fogel's *Producing Open Source Software: How to Run a Successful Free Software Project* (2013), producingoss.com/.

INVENTORIES AND HERITAGE MANAGEMENT

The Australian Experience

BY DAVID LOGAN AND RICHARD MACKAY

HERITAGE INVENTORIES AND STATUTORY LISTS ARE CRITICAL tools for managing cultural heritage in Australia. The inclusion of a cultural site on a statutory heritage list provides legal protection and guidance about permissible or desirable change. It also celebrates, educates, and supports good decision making. Heritage inventories facilitate comparative evaluation, confer status, and inform priorities for resource allocation. In short, heritage inventories make a difference.

Many decisions affecting heritage places concern their intended use or proposed physical changes. Where comprehensive inventories exist, these decisions are well informed. Conversely, if the approval system applies provisions to an incomplete or erroneous list, poor decisions and adverse heritage outcomes may result.

Australia uses heritage lists across all three levels of government: national, state, and local. The National Heritage List includes places with outstanding value to the entire nation, whereas state registers cover places of specific state significance. The Sydney Harbor Bridge, for example, is on the National Heritage List, while Sydney's major historic public buildings are on the state's heritage register. Both national and state registers involve rigorous research and assessment processes, including review by experts and formal determination by an elected minister.

At the local level, heritage is managed through planning instruments, which have provisions that apply to items on a statutory heritage list or schedule. *Schedule* is the term used at the local level, while *register* is the term used for the state statutory list; both provide legal protection. *Inventory* applies to the nonstatutory database that contains all of the information about the place. The inclusion or omission of a particular place on a heritage schedule has significant consequences. This situation has proven particularly problematic when a planning authority allows a property owner to opt out of heritage listing—even when the heritage value of the place has been clearly demonstrated.

The three-tiered Australian system can lead to the inclusion of the same place on more than one list (as well as on nonstatu-

The conservation policy in the heritage inventory record for this nine–story former warehouse in Sydney states that the roof form and mansard windows should be retained because of their high level of architectural significance, thus limiting opportunities for even a minor addition. Photo: Courtesy of Godden Mackay Logan.

tory lists, such as those compiled by professional interest groups, like the National Trust of Australia). An important but seldom applied principle for effective resource allocation is that heritage listing and statutory control occur at the appropriate level of government so that duplication and inconsistency are avoided.

ELEMENTS OF INVENTORIES

The fundamental elements of any heritage inventory are accurate identification of the place itself (and its boundaries) and a clear

articulation of values. To manage important places, it is first necessary to understand why they are important. If the articulation of values is incomplete or incorrect, problems can arise from a mismatch of expectations among regulators, interest groups, owners, and developers. The level of information provided may be dictated by the budgetary limitations of local authorities. A common issue for ongoing heritage management is the lack of appropriate, well-researched information and thorough justification for heritage listing. The absence of good inventory data can thereby endanger the very heritage that the inventories are established to help manage and conserve.

In Australia, heritage values are determined using aesthetic, historic, scientific, and social criteria, as well as other potential factors. These values have been derived from *The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (the Burra Charter).

In an adversarial system such as Australia's, where heritage listing or development may be judicially contested, heritage inventories must be robust. Decisions by Australian courts have allowed highly significant heritage places to be inappropriately altered and compromised because the heritage values were not clearly expressed. A particular challenge in compiling heritage inventories is identifying the visual setting of a heritage item in a way that adequately protects it from adjacent development. Experience shows that each word in the inventory listing may be open to dissection by planning lawyers.

Nearly every Australian heritage statute is supported by a related heritage inventory. In the state of New South Wales alone, there are more than twenty-seven thousand heritage items listed by local authorities, as well as several hundred conservation areas. Best practice in both heritage and statutory planning demands that every heritage item and conservation area have a separate inventory record. Though this requirement has generally been fulfilled, the data remain inconsistent.

Local government inventories vary in their complexity and in the amount of information and detail they provide. For example, the statement of heritage significance for a heritage item, regarded as the critical component of any heritage inventory, may range in length from a simple sentence to a short essay of several paragraphs.

Inventories for a heritage conservation area usually identify the heritage significance of the total area but may not necessarily assess the individual properties within it, which may total several hundred. Emerging best practice is that the contributory value of every individual property within a listed area (or a complex site containing multiple heritage items) should be identified, assessed, and mapped. The most useful mapping provides a color-coded grading system identifying the relative significance of each element.

INVENTORIES DESIGNED FOR MANAGEMENT

In the mid-1990s, the Sydney City Council funded the preparation of detailed inventories for four hundred potential heritage places. The assessment and inventory for each place cost approximately US$1,000. Every record contains detailed information—a historical overview, descriptions of the fabric and alterations, a significance assessment by criteria, a summary statement of heritage value, significance gradings for each element, and a preliminary conservation policy. Each inventory is, in effect, a simplified conservation management plan. From that standpoint alone, the inventories' preparation is extremely cost-effective.

In dealing with buildings, an important aspect of each inventory record is the significance grading of internal and external elements (structural system, window frames, etc.), as this information assists council officers in understanding which parts of the building are most significant. An innovative aspect of the Sydney City Council's inventory for each listed property is the inclusion of conservation policies (or management recommendations). These policies provide indications to owners and potential developers about the changes that may or may not be considered for each place. For example, the policy for a particular building may state that a vertical addition would not be appropriate. Thus, a potential purchaser planning to add floors to that building would be forewarned about the risks involved.

Since preparing the inventories, the Sydney City Council has faced far fewer disputes with owners or potential purchasers of the city's heritage-listed buildings. This political benefit was precisely the objective of the council's lord mayor in funding highly detailed inventories and conservation policies. Fifteen years after their preparation, the city's heritage inventories still represent best-practice Australian heritage management at the local level.
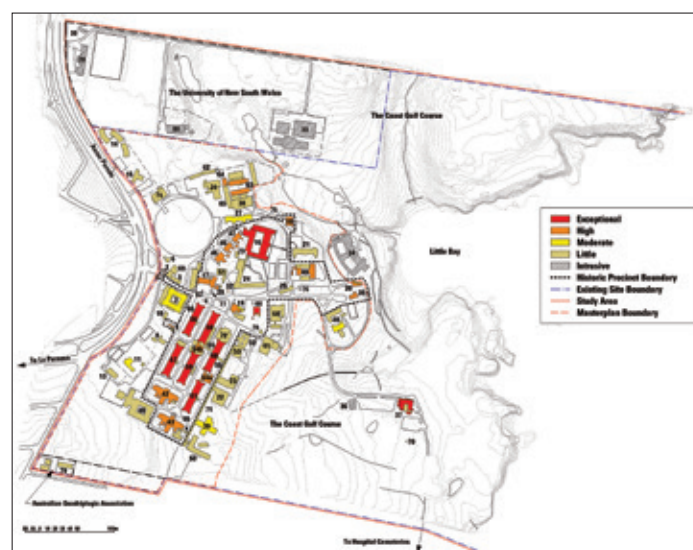
All individual elements at this former hospital site—including buildings, roads, and landscape features—were identified in an inventory and ranked according to their respective levels of heritage significance to facilitate the formulation of policies for their management. Image: Courtesy of Godden Mackay Logan.

To be effective, inventories must be available through online, accessible heritage information systems. In New South Wales, online multivariable searches can identify listed heritage at a local, state, or national level. The State Heritage Inventory database thereby functions as both a useful management tool and a source for comparative assessment. Critical attributes of any successful online heritage database are wide accessibility with a readily available operating platform, intuitive search methods, and easily manageable data downloads.

The presence of readily accessible information, however, can also be misleading and even dangerous. In practice, it is rare that inventories are comprehensive. Sometimes the necessary surveys have not been performed. Sometimes local authorities make a political decision not to list a significant place. Sometimes, because of the nature of the heritage—for example, a cultural landscape—that place is not easily included in a simple list. Therefore, best-practice heritage information and management systems should include provisions for protection of the underlying cultural resource, through general regulations and impact assessment.

ARCHAEOLOGICAL AND ABORIGINAL HERITAGE

Archaeological resources may be buried, unknown, and revealed only when change or development is proposed. In New South Wales, this issue is addressed through wide-ranging statutory provisions that provide protection to all archaeological features with cultural heritage significance. The onus is placed on development proponents to undertake surveys and assessments, to assess impact, and to propose mechanisms to deal with significant sites encountered during the construction process.

There are also examples of proactive archaeological heritage management. Parramatta was Australia's second European settlement and is now a satellite city located in western Sydney. The Parramatta Historical Archaeological Landscape Management Study (PHALMS) uses a geographic information system (GIS) platform and a connected relational database to manage the data for an entire historic city and its subsurface historical archaeological features, which date from the colony's earliest years.

PHALMS is founded on comprehensive historical research across the entire city area, combined with ground-truthing and analysis of results from previous archaeological projects. It provides a citywide predictive model indicating locations where archaeological features have been removed and where archaeological sites may yet be discovered. The significance of known or predicted archaeological sites is graded from "exceptional" to "low." An electronic database includes a summary history for every property, together with a succinct values statement, access to historic maps and other resources, and a clear indication of conservation policy and statutory requirements.

The PHALMS database is an archaeological inventory that is referenced in planning instruments and used by both local and state authorities as a tool for archaeological heritage management. It assists regulators, owners, and developers in understanding requirements, and it facilitates well-informed decisions. It is a best-practice model for managing archaeology in an urban context.

Managing Aboriginal heritage is more challenging. Aboriginal communities may consider their important sites private. And though they may contain no physical remains, sites may nevertheless be considered sacred. In the absence of systematic surveys, it can reasonably be presumed that Aboriginal objects will be present in areas that have not been greatly disturbed since the arrival of Europeans. In New South Wales this challenge is addressed by a combination of laws, management systems, and inventories. The State Office of Environment and Heritage maintains the Aboriginal Heritage Information Management System (AHIMS), which records known Aboriginal site data using a GIS platform with an associated database. The system is not publicly accessible, but those with appropriate needs and credentials may request records. Associated laws protect all Aboriginal objects. Permits and protocols involving consultation with Aboriginal people apply to activities that may disturb or harm Aboriginal objects. Aboriginal places, with or without physical evidence, may be separately registered and protected.

This multifaceted management system is not ideal, but given the complex and often conflicting views held by Aboriginal and non-Aboriginal people about the value and management of Aboriginal cultural heritage, it is a system that works and that accords Aboriginal people a clear role in managing their heritage.

The Australian experience is that even the best heritage inventory may not prevent new development from overwhelming adjacent heritage places or compromising values, such as visual setting, unless statutory controls are aligned with conservation policies and desired heritage outcomes. Where planning objectives and statutory controls (zoning, height limits, etc.) for an area are inconsistent with heritage values, it is unlikely that development opportunities will be forgone in deference to those values.

Well-prepared heritage inventories provide clarity regarding heritage values and objectives. They identify places that need to be protected and managed. They inform owners, regulators, and the community. They can help in assessing, managing, and celebrating heritage, and guide in the allocation of scarce conservation resources. In Australia, heritage inventories have grown to be essential in managing the change and development that affect our important heritage places.

David Logan and Richard Mackay are partners in the heritage consulting firm of Godden Mackay Logan, which is based in Australia.

WAR AND HERITAGE

Using Inventories to Protect Cultural Property

BY PETER STONE

ACCURATE, COMPLETE, ACCESSIBLE, AND SECURE INVENTORIES of all types of cultural property are an obvious requirement for the good management of such resources—which include archaeological sites, historic buildings, museums, and archives and libraries. These inventories form the bedrock of most national legislation concerning heritage protection and are a fundamental element of many international conventions, including the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict.

Unfortunately, such inventories frequently exist only as aspirations. When natural and human-provoked disaster strikes, the lack of good data is cruelly exposed, and significant heritage is often lost, along with the information it contains. Events of the last decade demonstrate the need for such inventories, particularly during armed conflict.

CULTURAL PROPERTY PROTECTION

On February 2, 2003, less than eight weeks before the invasion of Iraq by the United States/United Kingdom coalition, I was asked to help the UK Ministry of Defence (MOD) identify and protect the archaeological cultural heritage in Iraq. Despite reservations about the request's timing, I sought help from the most recent director of the British School of Archaeology in Iraq and the director of the (now-closed) Illicit Antiquities Research Centre in Cambridge, and we: (1) provided a list of particularly vulnerable sites, (2) stressed the vulnerability of museums and sites to looting, and (3) reminded the MOD of the United Kingdom's responsibilities under international law to protect cultural property—in particular under the Geneva Conventions, as the nation had not, and still has not, ratified the 1954 Hague Convention. While there was little damage to cultural property during the invasion, this result had more to do with the precise air bombardment, the careful identification of military and associated targets, the failure of the Iraqi armed forces to mount a credible defense, and the remoteness of most sites on this list and the list provided to the Pentagon than with advice provided on cultural property protection (CPP). This was only a qualified success because the military action did not address our last two points above, and the coalition's failure on these matters led to the entirely avoidable looting of museums and catastrophic pillaging of archaeological sites.[1] Since then, I have worked to encourage cultural heritage profes-

Ras Almargeb, Libya, where Gadhafi forces stationed six mobile radar units in proximity to an ancient Roman fort. All six were destroyed with minimal damage to the heritage site. Photo: © Joris Kila.

sionals, the military, and other players, especially politicians, in the United Kingdom and NATO, to take CPP more seriously.[2]

Western military strategists appear to have recognized their failings in Iraq and Afghanistan and now view protecting cultural property as what they call a "force multiplier"—something that makes their work easier. They have begun to acknowledge that by protecting cultural property they are more likely to win the hearts and minds of occupied populations, or at least not to alienate them. CPP has entered military consciousness as part of NATO's "comprehensive approach," a doctrine that affirms that the military cannot simply win a war but must also deliver a stable country.

However, CPP has yet to become integral to the comprehensive approach. In conjunction with others, I am working with NATO and several national militaries to develop a four-tier approach that incorporates CPP into military doctrine and planning.[3] Tier 1 requires CPP instruction within basic training for all military personnel at appropriate levels; at present, most NATO countries include some training with respect to CPP. Tier 2 is introduced when deployment becomes a possibility, and the military needs to review specific information about the cultural property it will encounter.[4] Tier 3 relates to activity during conflict, and tier 4 to post-conflict CPP in the period that the military calls "stabilization."

The four-tier approach requires the provision of lists of cultural property to be protected, if possible, during a conflict. Military leaders actually aspire to have a list for every country. However, we are a long way from being able (and perhaps willing) to supply such data. There is also the issue of who should

When natural and human–provoked disaster strikes, the lack of good data is cruelly exposed, and significant heritage is often lost, along with the information it contains.

provide these lists to the military. The list we gave to the UK military in 2003 was produced by British experts in coordination with colleagues in Iraq. In a parallel effort, US scholars provided US military and civilian planners lists of cultural sites to be protected, including locations of more than five thousand archaeological sites.[5] Lists for Libya and Mali were produced—as those conflicts developed—by expatriate and international experts

working primarily in the United Kingdom and the United States, with varying degrees of liaison with in-country colleagues. A similar inventory is currently being produced for Syria.

Many countries produce such lists as a part of their heritage management. Unfortunately, many do not, and numerous lists do not include the precise location coordinates needed by the military. The organization that should be promoting and facilitating the development of such lists is, perhaps, the International Committee of the Blue Shield (ICBS), established in 1996 and later identified to support the 1954 Hague Convention. However, the ICBS has not attracted sufficient funding to create an effective organization; neither has the Association of National Committees of the Blue Shield, created in 2008 partly to address shortcomings of the ICBS. The US Committee of the Blue Shield and the emerging UK National Committee have become, by default, the main conduits of information to their own militaries and NATO.

ISSUES WITH INVENTORIES

Experience has demonstrated some issues with inventories. The first is that lists need to cover all cultural property as defined in the 1954 Hague Convention, not exclusively archaeological sites and museums. This goal requires increased collaboration with colleagues across a range of disciplines, including museum professionals, architectural historians, librarians, and archivists. Such cooperation is being developed through the creation of national committees of the Blue Shield. But this slow, mostly unfunded work is frequently perceived as low priority.

The second issue is the size of lists. For Iraq we supplied a list of some thirty archaeological sites, in addition to museums. When I gave information in 2011 to the MOD and NATO for Libya, there were 1,685 sites on the list; nearly 400 sites were on the list provided in December 2012 for Mali, and at last count there were over 700 sites on Syria's provisional list. This difference in list size partly reflects differences in current knowledge of archaeological sites in particular countries. In Mali, for example, the sites identified around Timbuktu came from a recent survey, and *all* sites were included. For the rest of the country, only previously designated "sites of national importance" were included. The different lists prompted a variety of responses from different militaries, with some seeking as much information as possible and others requesting more "manageable" lists. The number of places to be protected during conflict was an issue raised by the UK Parliamentary Committee scrutinizing the 2008 draft bill that would have ratified the 1954 Hague Convention. The English National Heritage List has over 400,000 entries, a figure suggested, not unreasonably, to be impossible for the military to deal with effectively.

A third issue is when and by whom lists are produced. The publication of a definitive list for Syria was delayed, while fighting

continued, as four different lists—produced by four different groups with differing levels of contact with Syrian experts—were compared and collated. The different lists had different English spellings and therefore different records of the same sites. Some lists had good GPS data; others less good. Some had explanations of the importance of sites; others did not.

The fourth issue is the kind of data required. Few countries have detailed coordinates for cultural property, and only a small group can provide such data for archaeological sites; even here there are limits. For instance, only relatively recently was the United Kingdom able to provide detailed boundary data for some larger World Heritage Sites, including Stonehenge and Hadrian's Wall. If this country, with its long history of heritage management, has only recently been able to offer detailed information on its World Heritage Sites (surely the first sites to be identified on any list), there is little chance that less wealthy countries could provide such details—and yet, such georeferenced data are what militaries need.

While we do not yet completely understand the complexities of cultural heritage protection in times of conflict, there is comfort in

US Civil Affairs personnel, preparing to deploy to Afghanistan, receive training on the 1954 Hague Convention. Organized by the US Committee of the Blue Shield, the training is led by experts with on-the-ground experience. Here, archaeologist Dr. Fred Hiebert from the National Geographic Society provides an overview of cultural heritage in Afghanistan. Photo: © US Committee of the Blue Shield, 2010.

some recent efforts. While the lists of Libyan sites to be protected were compiled in haste, there was some success. For example, those loyal to the Gadhafi regime, presumably aware that NATO would take damage to cultural property into consideration, parked six mobile radar vehicles next to the Roman fort at Ras Almargeb. But with cooperation between heritage professionals and the military—and careful targeting—the military targets were completely destroyed with minimal damage to the heritage site.

Much work remains. Clearly the provision of inventories should be part of immediate predeployment activity. Some definitive steps would include developing networks, facilitated by the Blue Shield, which could produce all-inclusive heritage lists. It obviously would be best if all countries produced their own lists in a standard, internationally sanctioned format, well before conflict became a real threat (i.e., in tier 1). A goal might be to have these lists produced by nations in conjunction with the wider academic community.

Cultural property experts, the military, and other parties need to agree on the information required in lists and need to

create criteria to manage list size. The UK National Committee of the Blue Shield is in early discussions with the MOD about how best to prioritize sites. This prioritization would avoid the extreme of producing lists seeking to protect every place of historic or cultural interest—lists so large that they would inhibit successful military activity and thus be ignored—and help produce lists small enough to be accepted by the military that also protect important heritage. This work requires multinational and multiagency involvement, and the embryonic UK discussions are a prelude to this complex task.

We also need a debate about how widely these lists should circulate. In a conversation I had in 1999 with the minister of culture for Croatia, he noted that on the eve of war in the former Yugoslavia, Croatia had, as required by the 1954 Hague Convention, produced a list of property to be protected and sent it to UNESCO. He told me that in the fighting that followed, every site on the list was targeted by opposition forces. While debate about protecting cultural property during conflict mostly relates to unintended damage, in the Balkans conflict cultural property was targeted as part of a political strategy. We will never know (but can probably guess) whether the sites would have been targeted if the list had not been produced. Identifying sites on a list at least provides evidence to the world judiciary for the trials of those responsible for intentional damage—as indeed happened in the prosecutions for the targeting of the World Heritage Site of Dubrovnik.

Peter Stone is professor of heritage studies at Newcastle University and head of the School of Arts and Cultures. He serves as general secretary of the Association of National Committees of the Blue Shield and as chairman of the UK National Committee of the Blue Shield.

1. Peter G. Stone and Joanne Farchakh Bajjaly, eds., *The Destruction of Cultural Heritage in Iraq* (Woodbridge, UK: Boydell & Brewer, 2008).
2. Peter G. Stone, ed., *Cultural Heritage, Ethics, and the Military* (Woodbridge, UK: Boydell & Brewer, 2011).
3. Peter G. Stone, "A Four-Tier Approach to the Protection of Cultural Property in the Event of Armed Conflict," *Antiquity* 87, no. 335 (March 2013): 166–77.
4. Peter Stone, "Human Rights and Cultural Property Protection in Times of Conflict," *International Journal of Heritage Studies* 18, no. 3 (May 2012): 271–84.
5. McGuire Gibson, "Culture as Afterthought: US Planning and Non-planning in the Invasion of Iraq," *Conservation and Management of Archaeological Sites* 11, nos. 3–4 (November 2009): 333–39.

FACING DISASTER

The Importance of Heritage Inventories in Preparation and Response

BY DEIDRE MCCARTHY

FOLLOWING ANY DISASTER, LIFE, HEALTH, AND SAFETY TAKE PRECEDENCE and are the immediate focus of first responders. US federal laws require responders to also address the impact of any federal undertakings on cultural resources, consult with states and tribes, and examine cultural resource inventories. Such inventories are indispensable for protecting cultural resources, and their development and maintenance should be part of all disaster preparations. Essential for understanding the resources in danger, inventories speed responses and minimize impacts. The accuracy, currency, and completeness of an inventory determine its utility in identifying resources on the landscape and specifying their importance.

Technologies such as geographic information systems (GIS) provide for accessing data and performing analysis, and they help to coordinate activities—leading to better decisions. The value of that analysis depends on the existence and quality of data. Without an accurate inventory, responders spend valuable time identifying instead of evaluating resources, slowing the response and preventing recovery. Recent disaster responses highlight the shortcomings of current approaches, and evaluating them can lead to improvements.

LESSONS FROM RECENT EXPERIENCE

In 2005, Hurricane Katrina devastated portions of the US Gulf Coast and created the largest cultural resource disaster in the country since passage of the 1966 National Historic Preservation Act (NHPA), inundating historic districts, exposing archaeological sites, and damaging buildings beyond repair.

The NHPA established the National Register of Historic Places and created state and tribal historic preservation offices, which maintain local inventories. The NHPA also requires federal agencies, such as the Federal Emergency Management Agency (FEMA), to consider the impact of their actions on sites determined eligible for the National Register. Legally, assessing the historic integrity and significance of a resource—and determining whether the disaster or responses will negatively alter that integrity—must occur prior to any federal undertaking.

After Katrina, the National Park Service's Cultural Resources

GIS Facility (CRGIS) created a methodology to help FEMA meet its NHPA obligations.[1] Using global positioning system (GPS) devices, surveyors located and evaluated properties identified as safety threats, establishing their National Register eligibility. GIS was used to examine the GPS data, assess properties, and record decisions about whether federal actions constituted adverse effects, requiring mitigation to remedy or offset those effects. CRGIS incorporated cultural resource spatial data transfer standards, creating a GIS management tool and promoting data exchange among recovery agencies. Through the methodology, FEMA

Floodwaters surrounding homes in New Orleans in September 2005, two weeks after Hurricane Katrina hit the city. Photo: David J. Phillip/AFP/Getty Images.

(Top) Screenshot of the original Louisiana State Historic Preservation Office GIS data before Hurricane Katrina. It focuses on New Orleans and historic district boundaries. (Bottom) Screenshot of the expanded GIS data, including data collected subsequent to Katrina as part of the hurricane response efforts. Images: Courtesy of Cultural Resources GIS Facility, National Park Service.

created a geodatabase of resources incorporating locations, condition, integrity, and National Register eligibility information.

Prior to Katrina, the Louisiana State Historic Preservation Office (SHPO) had nineteen thousand resources in its statewide GIS. Following the response, fifty-five thousand resources in the New Orleans area were added. The substantial amount of new data FEMA provided to the SHPO served to mitigate (i.e., offset) demolition of damaged historic resources. Because this data is digital, standardized, and easily shared, all agencies in the area have access to it to prepare for and respond quickly to future disasters.

More recently, the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 and Hurricane Sandy, which struck the US Northeast in 2012, help illustrate challenges in disaster response and highlight deficiencies in existing inventories. The National Register catalogs over one million resources, while state and tribal inventories catalog over five million. No national standards guide creation of these inventories; they differ in completeness, accuracy, and data format. Most states, tribes, and federal agencies maintain inventories independently and do not coordinate data sharing.

The exchange of data among states after these disasters emphasized differences in data collection and accuracy protocols. National data sets also displayed data inconsistency and variations in quality. These differences prevented data use across jurisdictional boundaries, which is critical during disasters.

Without consistent collection methods, data sets may not be integrated because the quality, consistency, scale, and detail are so different. These disasters also demonstrated the need to facilitate faster data exchange, since rapid coordination is essential. Many responders remain unaware that inventories must be consulted. In the Katrina response, as many as seven different agencies visited properties in New Orleans to assess damage, and none collected a location or consulted existing inventories.

RECOMMENDED BEST PRACTICES AND CONSIDERATIONS

Knowledge gained from disasters—which test inventory effectiveness under the worst circumstances—leads to new approaches. Such efforts should begin before a disaster by properly preparing appropriate inventory information in a GIS format. Providing responders with this data delivers a graphical understanding of the location of potential threats and allows for analysis. During this preparation, agencies should create long-term data management, updating, and security plans, as well as allow for adoption of improved technologies to assist in data collection, sharing, and access.

In addition, data should be standardized to permit broad and rapid sharing. For cultural resources to receive consideration following a disaster, inventories must quickly integrate with general response efforts. A group of federal, state, and tribal representatives, led by CRGIS, is creating national cultural resource spatial data transfer standards to facilitate data sharing through the Federal Geographic Data Committee. Establishing data sharing agreements prior to disasters facilitates data exchange and clarifies the roles of parties, which will expedite response. Although broadly sharing data is desirable, data should, of course, be properly used. Documenting data sensitivity, quality, and accuracy helps define its appropriate uses and access parameters.

As technology evolves, cultural resource inventories and their uses will change. But the need to maintain these critical records to accurately identify and protect sites will never change. The ability to access and share information remains central to disaster planning and response. Data standards will ensure that cultural resources are incorporated into disaster preparations and response efforts, leading to efficient evaluation and improved protection of these resources.

Deidre McCarthy works at the Cultural Resources GIS Facility of the National Park Service in Washington, DC, where she assists historic preservation offices and National Park units to integrate GIS and GPS into their preservation activities.

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1. CRGIS website, link to the Historic Preservation Response Methodology www.nps.gov/history/hdp/standards/CRGIS/katrina.htm

TAKING STOCK

A Discussion about Inventories and Heritage Decision Making

GILLIAN GRAYSON is the head of Heritage Data Management for English Heritage, spearheading work on heritage inventories, data access, data standards, and a partnership with Local Authority Historic Environment Records.

JANET HANSEN, the deputy manager of the Office of Historic Resources for the City of Los Angeles, is overseeing SurveyLA, Los Angeles's citywide historic resource survey.

DANIELE PINI is professor of urban planning at the Department of Architecture, University of Ferrara, and is a consultant in Italy and abroad in planning and urban design, focusing on urban heritage and landscape conservation.

They spoke with **DAVID MYERS**, senior project specialist at the Getty Conservation Institute, and **JEFFREY LEVIN**, editor of *Conservation Perspectives, The GCI Newsletter.*

DAVID MYERS   What are the primary end uses and end users of heritage inventories or information systems—and which of those is most important, in your experience?

DANIELE PINI   I work mostly on historic urban areas and use inventories for conservation and rehabilitation plans that I have coordinated for UNESCO, such as in Sana'a, Jerusalem, and now in Cairo. The primary users are administrations involved in the management of these historic cities. Of course we have other possible end users—the greater public, scholars, universities, and professionals. The inventories, first of all, document the state of conservation and the condition of the urban fabric. Second, they are effective in analyzing the threats to the urban fabric— and by threats I mean not only to buildings but also to the open spaces, which have a relevant heritage interest. A third aspect is the implementation and the monitoring of a conservation program, since the inventory represents a baseline for monitoring what is happening to the urban fabric. The inventory can also be a tool to make evident to the greater public what is happening in a city and what problems may exist in a historic urban area.

GILLIAN GRAYSON   In England, local authorities are charged with running the planning system and more specifically with protection of the heritage. The role of English Heritage is to support decision makers in ensuring that the best of England's heritage is protected and sustained. We do this by running a national designation system identifying the most important physical remains of our past. The National Heritage List for England is our inventory of all nationally designated heritage assets. In terms of users, the majority are professionals—heritage specialists, heritage champions, planners, conservation specialists—who are familiar with the historic environment and our information systems. We also have an inventory called the National Record of the Historic Environment, which is used to enhance our knowledge of heritage assets. The majority of its users are professionals, but there is a significant proportion of academic researchers who want to understand the historic environment. For both inventories, the general public segment is currently small, but we have identified this as a growth area.

JANET HANSEN   I see similarities in Los Angeles with SurveyLA, our citywide survey. Los Angeles has close to a million legal parcels within 469 square miles, so we are amassing tens of thousands of records on properties that will be added to an existing inventory of designated resources. Right now we are thinking through who the end users will be but are focusing mostly on providing information for policy makers. The city's historic preservation program is based in the planning department so that we can strengthen the relationship between preservation and planning and use inventory data to inform planning policies and decisions. For example, Los Angeles has a community plan program, which guides land use citywide. These plans are being updated for the first time since 1990, and information on potential historical resources plays a big role in their development. Also, in California and nationally we have environmental review laws that affect historic resources, and having heritage data readily available is important for informing project decisions. We're also considering other uses for the data, such as promoting heritage tourism, which is often undervalued in the US as a preservation tool. Another use is expediting disaster response. Our Building and Safety Department has responsibility for surveying buildings following natural disasters, such as earthquakes. Without information on which properties are designated or potentially significant, demolitions may occur without the proper level of review. We've also been working with the

Photo: Joanna Webster

We strongly believe that heritage data should be as accessible as possible.
GILLIAN GRAYSON

film industry with regard to filming locations. A heritage inventory that can be searched by property type, construction date, architectural style, and location would provide access to new locations citywide. To inform the development of our inventory website we've held meetings with a variety of potential users to ask them how they might want to use the data, how they'd like to see it displayed, and what information they may be looking for.

PINI Are the buildings you have records on all within a historic heritage area?

HANSEN In Los Angeles we are surveying buildings and also structures, such as bridges, objects and landscapes, street trees and streetlights—we cover a wide range of property types.

GRAYSON It's the same in England. We cover a very wide range of heritage asset types—buildings and archaeology. At the national level, we don't focus on finds or objects unless they are indicative of a monument.

MYERS Janet, could you define what you mean by "object"?

HANSEN The definition is taken from the National Park Service resource types. It's a resource that is typically stationary but is not a building or a structure. Examples would be a streetlight, tree, sculpture, and other public art. For example, in our survey, we're recording the city's entire system of air-raid sirens from the World War II and Cold War eras, which is probably one of the most intact systems in the country. We're also recording historic districts. This presents a challenge not only in collecting data, but also in how the data is presented in terms of a heritage inventory because it's about the relationship between resources, and not just about a single resource.

PINI In Italy, many regions require a survey of all buildings—be it heritage buildings or not—within the perimeter of the historic center. The perimeters can be large, and information is not merely aimed at defining the heritage value of each building and their state of conservation. The documentation is used to understand what kind of intervention can be done on each building. Last year in the Ferrara region we had an earthquake, and the inventories were extremely useful in making a first estimate of the damage. Very often the inventories of municipalities are more efficient than the regional or national ones, but in our region, the two inventories—one from the municipalities, of buildings within historic centers, and the other from the regional department of the ministry—were merged, which was useful for damage estimates and also for identifying the priorities for intervention. In other regions, it's not always the same.

MYERS What is the role of information standards, as well as training, in ensuring the quality and consistency of inventory data?

GRAYSON Standards are essential. It's about common formats and vocabularies for information sharing, enhancing retrieval and promoting consistency. Within English Heritage, we have an in-house team that develops and maintains standards and vocabulary. We've got lots of experience working collaboratively with partners nationally and internationally on developing standards, including the CIDOC International Core Data Standard for Archaeological Sites and Monuments and the CIDOC CRM—the conceptual reference model. And we've worked closely with colleagues on developing vocabularies like the Thesaurus of Monument Types. One of the reasons I'm excited by the GCI's Arches project [see p. 4] is because it's using standards we helped shape. It's very useful to be able to evolve our standards based on practical experience from projects such as Arches and other initiatives that have given us insight into how standards can ensure we have systems and processes that encourage sharing.

MYERS Could you explain the value of vocabularies?

GRAYSON The words we use to index our information are very important. With a common vocabulary, we know that we're talking about the same things, and that makes it much easier to share information.

PINI This is a critical issue because information on standards is limited. They mostly concern individual heritage buildings, but in urban conservation inventories they address the urban

> In the US generally, public engagement in surveys and the development of heritage inventories is critical.
>
> JANET HANSEN

fabric and may include recent buildings or ones that don't have a specific heritage interest. In that case, it is difficult to use international standards—based on my experience. In every city and situation, you have to define adapted standards and a specific vocabulary when you plan your survey and inventory. Related to this is the training of the surveyor and the people who will use the inventory. This is a critical issue, not only in countries like Egypt or Yemen, but also in Italy. The structure of the inventory could be more or less the same everywhere, but the architectural elements that may be important to define the heritage value of a building in Italy are totally different from Egypt, for instance, and the vocabulary has to be different.

JEFFREY LEVIN You're suggesting that when you drill down with respect to inventories, international standards are not easily applicable in all situations.

PINI Not in my experience—probably because we're talking about the interpretation of the architecture and about the suggested types of interventions. International standards mostly refer to the kind of architecture you have in Europe or Western countries, but this cannot apply to buildings where the inner space is more important than the facade, because the real facade of the building is inside, not outside. There are also totally different architectural elements, architectural techniques, and materials. So it must be defined on the basis of local context, local culture, and local know-how.

GRAYSON We certainly found that international standards are helpful in defining the core data you need. It is really important that you have a core you're able to share with others. Outside that core, of course, we all have specific needs and have to develop those accordingly.

HANSEN We've had some difficulty with information standards because we had little to work with from the start. We follow state and federal guidelines for completing historic resources surveys, and with those guidelines come a limited set of information standards, which sometimes overlap. These standards are also designed to populate fields on hard-copy survey forms and don't necessarily function efficiently in database format. So we needed to develop information standards based on the core principles in use for state and federal guidelines but with sufficient detail to allow us to classify resources in a way that is useful to us and provides the public with adequate search capabilities. For example, when recording property types, the state has a generalized category for religious buildings, but in Los Angeles many resource types might come under the concept of religion—and maybe not even buildings. And so in our database you will be able to search more specifically by "temple" versus just a religious building, where you'd get the entire inventory of religious buildings. For us, information standards are just as important for the people conducting the surveys as for information retrieval and analysis. It's been critical that the surveyors are all thinking the same way and applying the same terminology. We also have the challenge of dealing with social, cultural, and historical resources, and developing standards for interpreting resource significance within those themes. We have training sessions for our field surveyors so that we're sure everyone is interpreting the standards and terms the same way.

PINI I would underline the need for training of the surveyor. Training is essential so that all the surveyors do the same kind of evaluation on the same kind of building and that the evaluation of different buildings and spaces of the city is reliable and justified. It's absolutely fundamental.

GRAYSON Part of our training includes persuading colleagues that standards are really important—and that can be quite difficult. For example, specific vocabularies can be viewed as a constraint, so we have to persuade them that there are real benefits in using standards and shared vocabularies because it makes information searching and sharing much easier.

MYERS How important is sharing cultural heritage information among different systems, and how do you address this challenge?

HANSEN This is something we've grappled with. We have sur-

vey data going back to the 1970s—most of which exists in hard copy only. Some survey data is accessible in electronic format starting from about the 1990s. For us now the goal is to get all cultural heritage data into one place, and we're hoping the SurveyLA database becomes the repository for survey data from all city agencies in Los Angeles. For example, there are surveys going on concurrently in the Bureau of Engineering and the Housing Department, and without access to their information, we don't know what they've done. In addition to city agencies, the school district and other county, state, and federal agencies also conduct surveys. We're duplicating efforts in some cases, which is a huge waste of resources. Having all survey and other heritage data in one place that's easily searchable and accessible by any of these organizations is critical to developing a comprehensive inventory for Los Angeles.

GRAYSON We've grappled with this as well. We've championed the use of common standards and vocabularies in our databases, but systems development has often focused more on recording information within those systems rather than on getting data in or out. We've got systems that still have limited data import and export functionality. It frustrates our partners because they need data in formats that they can easily use, and sometimes it's a struggle for us to provide that. In the past, development of information systems has been driven by specific projects, rather than by broader information strategies. We're addressing this by developing structures that encourage people to collaborate and by thinking about interoperability. We've also established working groups that operate across the organization—for example, a terminology working group that encourages use of common vocabularies rather than each system developing its own vocabularies. We've become better at making data available online too, including the National Heritage List and PastScape, a website that provides access to the National Record of the Historic Environment. We've also got a website called Heritage Gateway, where you can cross-search nine national resources and forty-seven Local Authority Historic Environment Records. The next step is improving our data download facilities so that users can easily include our data in their own systems.

PINI In many Italian regions, municipalities are obliged—within the framework of the urban plan—to give a description of each building within the perimeters of the historic centers. We have huge databases for cities like Venice, which has some forty thousand records. But even with huge databases, there are two problems. First is the technical issue—some administrations don't have digital inventories or are not well equipped digitally. Moreover, not all administrations have compatible software because some of them use very old databases. Then you have a political problem because in order to overcome this techni-

cal difficulty, you need political will—you need to spend money and you need to train people. It can be a political problem if the political color of the municipality is not the same political color as some specific ministry, for instance. So the situation in Italy is diverse, and there is a need to solve technical problems as well as political ones.

LEVIN How important is it for cultural heritage information to be broadly accessible, and under what circumstances does it need to remain confidential?

PINI In the databases of the municipalities you may have information concerning the income and tax paid by the lenders, and this, of course, is not accessible. But the rest is public, to help prevent any possible demolition, and to prescribe the type of intervention that can be done on a building. Generally, data concerning land use, number of households, number of inhabitants, and, of course, the heritage values of the building, type of construction and so on, is available. This data, for instance, is used by my students when they work on a revitalization project for a neighborhood.

GRAYSON We strongly believe that heritage data should be as accessible as possible. But there are instances when information must remain confidential in order to protect the historic environment. For example, sensitive archaeological find spots won't be identified precisely online so that sites can be protected. It's not so much an issue for our national record because generally we don't record finds except where they indicate monuments, but it is an issue for initiatives like the Portable Antiquities Scheme that encourages voluntary recording of archaeological objects found by the public. It's also an issue for our Local Authority Historic Environment Records, which include that data. Approaches taken to reduce the risk include website registration—you have to register to access more advanced functionality, or you have different levels of access for different user groups.

HANSEN From the beginning of SurveyLA, we've promoted public accessibility to the data. It has always been our intent to develop a website that is broadly accessible, and in that regard, we are working with the GCI right now as part of their Arches project. We're fortunate to be getting the core version of Arches customized for Los Angeles, which will allow us not only to manage the data but also to make that data publicly accessible. Confidentiality for us applies primarily to archaeological resources, and we're not surveying those at this phase of SurveyLA.

PINI About confidentiality, we had a problem when I worked in Jerusalem with UNESCO. The GIS database was meant to be accessible to both Israelis and Palestinians, but there was a difficult political discussion about some data being made available

to both parties. The sensitive data concerned the occupation of buildings—if the buildings were empty or were used, how many inhabitants and so on. In the end, we managed to make all the data available to all. Concerning the vocabulary, this was also an interesting story. Buildings can have different names in different languages or for different groups: an Islamic name, a Hebrew name, and another one for the Christians—and you have many types of Christians. So one problem was documenting the different names of each building using different alphabets. This created a technical problem with the software.

GRAYSON The vocabulary issue is quite common and something we've been tackling. Generally we're focusing more on concepts because you can attach labels in different languages, and it more accurately reflects the different words used to describe things, rather than having to choose one as the preferred.

LEVIN Could we talk a bit about the need to increase public engagement with respect to inventories?

GRAYSON We believe that by understanding the historic environment, people value it. By valuing it, they'll want to care for it. By caring for it, they'll come to enjoy it—and from enjoying the historic environment comes that thirst to understand. With the inventories, we're trying to achieve this by ensuring that we hold, acquire, and provide easy access to up-to-date information and also encourage users to provide feedback so that we can enhance the information. For the National Heritage List for England—our statutory information—we've got a fast-track correction procedure for dealing with what we call minor amendments to the list entries. These include changes of building names and street numbering, and simple spelling corrections. Requests for minor amendments can be submitted by e-mail, while amendments that affect the grade or the reason for designation have to follow the full statutory amendment procedure. Again, we've got online application forms for people to do that. For the National Record of the Historic Environment, our other inventory, we've got a feedback form on our website, and users can contact us by e-mail. So we're encouraging people to work with us. Engagement is so important for protecting and caring for the historic environment.

PINI In Italy we don't have anything equivalent to English Heritage. Our ministry of culture and the regional offices of the ministry don't do public engagement except in a few cases. This kind of work is done mainly by two or three associations, and they're beginning to have their own inventories, which are very limited. Unfortunately, heritage to us is an economic asset—from the real estate point of view or the tourist point of view. In other countries, the situation is even worse, with no public engagement. For instance, we did a historic Cairo visitor map, where

we used our inventory to identify the most important registered or not-registered buildings. But the distribution of this map has been limited to professionals, academics, and administrators.

MYERS In your work outside Italy, to what extent do you engage with the public to gather information for your inventories?

PINI The inventories are made by us and the team we set up, using the local ministry of culture or relevant administrations. We plan the survey and the system, design the database, and train the people to do surveys. In Jerusalem it continues, and the system is more or less used. In Sana'a, it was used for one year and then completely stopped because the general organization for historic cities of Yemen was without budget and staff. Now, after five years, the GIS we set up is completely useless because it's never been updated. Nobody uses it. Which makes the point that keeping the system alive is probably the most important task. In Cairo, we are beginning an urban conservation inventory, training twelve surveyors from different Egyptian administrations who are working together for the first time. What is interesting is that there are two NGOs that have been involved in the survey's development and are organizing events to raise public awareness, with schoolchildren, women's associations, and so on. Hopefully, preparation of the inventory can be an activity that raises public awareness and that asks people to consider their own historic environment in a different perspective—not simply as old houses to be demolished but as a heritage to be preserved. This just started, and it's an exciting experience—but I cannot be very optimistic because of the situation in Cairo now.

MYERS When you collect data, do you interview the local community to determine the significance they attribute to different buildings or public spaces?

PINI Yes, we do interviews with families on social and cultural aspects. Cairo, from this point of view, is a very special case because 75 percent of the households have never left historic Cairo. There is an extraordinary rootedness of the population, and an extreme wealth of oral information. I don't know what we can do with this kind of information from the regulatory point of view, but I hope it will be used by anthropologists or historians.

LEVIN Janet, isn't public engagement critical to the work your office is doing?

HANSEN Correct. In the US generally, public engagement in surveys and the development of heritage inventories is critical. From the start of SurveyLA, we developed an extensive public outreach program that we've added to and modified over time as we've learned what works and what doesn't. For example,

Heritage should be deemed an asset for the future. Every conservation activity is future oriented.

DANIELE PINI

we, too, have an online form that people can fill out and send electronically, which provides information about a particular building or a historic area that should be included in the survey. We fully admit to the public that SurveyLA is a huge endeavor, and with limited resources we don't have the luxury of doing intensive property-specific research that is generally associated with historic resources surveys. So the more input we get from the public the better. We've held public meetings with varying levels of success, and more recently we have developed a social media program with a social media coordinator and a website called MyHistoricLA.org. The website allows people to map and submit information about places of importance to them. Generally, they are submitting information in response to questions we post about specific themes and topics. We emphasize places of social, historical, and cultural significance because those are more difficult to determine in the field than resources that may be architecturally significant.

GRAYSON Volunteer projects are also important to us. With greater pressures on resources, it's even more important to engage communities and to harness that interest and enthusiasm for the historic environment. Volunteers can be powerful advocates, and that's really important.

LEVIN What recommendations would each of you have for improving practice related to inventories and information systems?

GRAYSON I've got four. First is the importance of safeguarding data for the future. I'd like to see us address that by working closely with partners to put in place joint policies and strategies. Second is to focus on working collaboratively to share knowledge, expertise, ideas, and tools—and to be much more mindful of the needs of our partners and stakeholders. We tend to focus on our own requirements and don't always see the bigger picture. I'd like to encourage broader thinking and working jointly to eliminate overlap and duplication, particularly in the context of diminishing resources. My third recommendation is to make data as widely accessible as possible. I'd like to see greater use of common standards and vocabulary, and much

more of our data available as open data. And I'd like to see more investment in databases and other tools that support easy and efficient data sharing. My fourth recommendation is that we continue to invest in audience research so we can better understand the needs of our users.

PINI I agree on all the points that Gillian made and would stress the importance of a holistic approach to heritage—linking heritage protection to urban planning and considering heritage not only as an economic asset but also as a driver for social cohesion. Heritage should be deemed an asset for the future. Every conservation activity is future oriented. We also need to keep these systems alive. As demonstrated by the experience in Sana'a, if you don't continuously update information, the system in the end will be almost useless. This requires continuity in the presence of the staff and in training. I would also emphasize the importance of local communities, which are absolutely essential to the protection and rehabilitation of historic areas, and also to the regeneration of the life and environment of these areas.

HANSEN One problem we have in the United States is agencies sharing information about systems being developed. And the fact that we are developing separate systems to conduct the surveys and manage the data. And sometimes it is one or another, but not both. The optimum—and this grows out of our SurveyLA experience—is to have an integrated system that works efficiently for conducting field surveys and then allows for a seamless flow of data into the data management system. There is much we learned in the years leading up to SurveyLA and then, of course, during the survey process itself. There may be a benefit in sharing our experiences. As we move toward the project's culmination, it would be great to take the lessons we've learned and apply them in other situations. In some respects, I think we've changed the way that people think about doing surveys and using survey information. While the survey data we're collecting is, in itself, an amazing accomplishment, what we have learned along the way is just as important.

Key Resources

Heritage Inventories

POLICY DOCUMENTS, STANDARDS & GUIDELINES

Core Data Index to Historic Buildings and Monuments of the Architectural Heritage (standard adopted by the Council of Europe in 1995), in *Documenting the Cultural Heritage*, edited by Robin Thornes and John Bold (1998), Los Angeles: J. Paul Getty Trust.
archives.icom.museum/objectid/heritage/core.html

ICOMOS: *Principles for the Recording of Monuments, Groups of Buildings and Sites* (1996).
www.icomos.org/charters/archives-e.pdf

Information and documentation: a reference ontology for the interchange of cultural heritage information (ISO 21127:2006) by International Organization for Standardization (2006), Geneva: International Organization for Standardization.
www.cidoc-crm.org/

International Core Data Standard for Archaeological Sites and Monuments (standard adopted by CIDOC Archaeological Sites Working Group in 1995), in *Documenting the Cultural Heritage*, edited by Robin Thornes and John Bold (1998), Los Angeles: J. Paul Getty Trust.
archives.icom.museum/object-id/heritage/int.html

MIDAS Heritage—The UK Historic Environment Data Standard by English Heritage (2012), Swindon, UK: English Heritage.
www.english-heritage.org.uk/publications/midas-heritage/

UNESCO: *Recommendation Concerning the Protection, at National Level, of the Cultural and Natural Heritage* (1972).
portal.unesco.org/en/ev.php-URL_ID=13087&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO: *Second Protocol to the Hague Convention of 1954 for the Protection of Cultural Property in the Event of Armed Conflict* (1999).
portal.unesco.org/en/ev.php-URL_ID=15207&URL_DO=DO_TOPIC&URL_SECTION=201.html

ONLINE RESOURCES, ORGANIZATIONS & NETWORKS

Archaeology Data Service/Digital Antiquity Guides to Good Practice
guides.archaeologydataservice.ac.uk/

Forum on Information Standards in Heritage
fishforum.weebly.com/index.html

Heritage Data: Linked Data Vocabularies for Cultural Heritage
www.heritagedata.org/blog/

ICOM International Committee for Documentation (CIDOC)
network.icom.museum/cidoc/

ICOMOS International Committee on Heritage Documentation (CIPA)
cipa.icomos.org/

Informing the Future of the Past: Guidelines for Historic Environment Records
archaeologydataservice.ac.uk/ifp/
These guidelines, edited by Paul Gilman and Martin Newman, have been developed to assist those who manage, work in, and use historic environment records (HERs).

BOOKS, JOURNALS & CONFERENCE PROCEEDINGS

Architectural Heritage: Inventory and Documentation Methods in Europe: Proceedings, European Colloquy Organised by the Council of Europe and the French Ministry for Education and Culture—Direction du patrimoine, Nantes, 28–31 October 1992 by the Council of Europe (1993), Strasbourg: Council of Europe Press.
www.coe.int/t/dg4/cultureheritage/heritage/resources/Publications/Pat_PA_28_en.pdf

City Inventories by Francesco Siravo, in *Recording, Documentation, and Information Management for the Conservation of Heritage Places: Illustrated Examples*, edited by Rand Eppich and Amel Chabbi (2007), Los Angeles: Getty Conservation Institute.
www.getty.edu/conservation/publications_resources/pdf_publications/pdf/illustrated_examples1.pdf

Documenting the Cultural Heritage, edited by Robin Thornes and John Bold (1998), Los Angeles: J. Paul Getty Trust.
archives.icom.museum/objectid/heritage/fore.html

Guidance on Inventory and Documentation of the Cultural Heritage, Document Prepared by the Ad hoc Group for Inventory and Documentation within the Technical Co-operation and Consultancy Programme by the Council of Europe (2009), Strasbourg: Council of Europe Publishing.

Introduction to Controlled Vocabularies: Terminology for Art, Architecture, and Other Cultural Works by Patricia Harpring (2010), Los Angeles: J. Paul Getty Trust.
www.getty.edu/research/publications/electronic_publications/intro_controlled_vocab/

The Inventory of the Historic City of Sana'a: A Tool for Urban Conservation by Daniele Pini (2008), Paris: UNESCO World Heritage Centre.
whc.unesco.org/uploads/activities/documents/activity-569-1.pdf

For more information on issues related to heritage inventories, search **AATA Online** at **aata.getty.edu/home/**

GCI News

Project Updates

ATLAS OF ANALYTICAL SIGNATURES OF PHOTOGRAPHIC PROCESSES ONLINE

In August 2013 the GCI released the first installment of *The Atlas of Analytical Signatures of Photographic Processes*. Available online, the *Atlas* currently provides detailed scientific information on eleven of the most common and important traditional black-and-white chemical photographic processes and process variants (there are about fifty). The publication can be accessed free of charge at www.getty.edu/conservation/atlas.

Photograph conservators, art historians, archivists, library professionals, and others responsible for the care and preservation of photograph collections will find important information and tools for the identification of photographic processes in the *Atlas.* In addition to serving as a significant resource for the analysis of photographs, the *Atlas* captures and reassembles critical information regarding these historic processes—information at great risk of being lost in these waning days of chemical photography.

The *Atlas* is a product of a decade-long GCI project to develop innovative research methodologies for scientific analysis and identification of more than 150 different photographic processes (and process variants) that were invented, advanced, and sometimes forgotten during the nearly two centuries of the chemical photography era. Future installments will include additional photographic processes, as well as new information about processes already covered. The aim of GCI scientists is to make the *Atlas* a comprehensive reference of well-researched, experimentally tested, and objective data on chemical photographic processes and important process variants.

SEISMIC RETROFITTING IN PERU

In May 2013 the GCI conducted a condition assessment of the wall paintings of the Church

South interior of the Church of Santiago de Kuño Tambo in Peru, with its seventeenth–century wall paintings. Photo: Mario Santana, for the GCI.

of Santiago de Kuño Tambo in Peru. This field campaign was part of the GCI's Seismic Retrofitting Project, which tests and designs retrofitting techniques for historic earthen buildings. Through in-depth analysis of four prototype historic buildings in Peru, the project—a partnership among the GCI, University College London (UCL), the Pontifical Catholic University of Peru (PUCP), and the Peruvian Ministry of Culture—is developing guidelines to protect earthen structures against earthquakes.

One of the four prototype buildings being investigated is the church of Kuño Tambo. This seventeenth-century adobe church in the Andes Mountains southwest of Cusco has valuable wall paintings requiring protection prior to retrofitting; before protection can be implemented, the conditions of the wall paintings need to be documented. In May 2013 the GCI team, with participation of wall paintings conservator Clemencia Vernaza and Carleton University in Ottawa, performed assessments using previously produced orthophotos to map conditions. Specialists from the Ministry of Culture of Peru, together with architects of the archbishopric, rounded out the team.

During the campaign, Luis Peirano, Peruvian minister of culture, visited Kuño Tambo, emphasizing in a speech to the community the need for preservation of the heritage and traditions of the village. GCI project manager Claudia Cancino presented the ongoing work to the community and ministerial authorities. The work at the church of Kuño Tambo is supported by a grant from the Friends of Heritage Preservation.

MOSAIKON

Last spring and summer, GCI staff traveled to Tunisia for work related to MOSAIKON, a project of the GCI, the Getty Foundation, ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), and the International Committee for the Conservation of Mosaics that seeks to advance the presentation and conservation of mosaics in the Mediterranean region.

Regional Technician Training, Tunisia

The third six-week training session in this component to train technicians to care for in situ mosaics was completed in May at the Roman-Byzantine site of Bulla Regia, Tunisia. This session, organized with Tunisia's Institut National du Patrimoine (INP), provided attendees from Morocco, Algeria, Libya, and Tunisia

with training in stabilization treatments and in preventive conservation measures.

During the final week, the site directors of the trainees visited Bulla Regia to see the training and to discuss with trainees their work as mosaic conservation technicians. The visit also provided an opportunity for the supervisors to discuss the challenges they face and the opportunities presented by having trained technicians at their sites. On the second day of the site directors' visit, they met with the INP director-general, who proposed hosting a follow-up meeting of North African directors-general to discuss ways of cooperating to advance mosaic conservation in the region. The meetings were also attended by senior officials from Algeria and Libya, as well as by the director of Monuments and Sites of the INP.

Bulla Regia Model Field Project

A three-week campaign was conducted at Bulla Regia in June. The project team continued conservation treatments of mosaics in the Maison de la Chasse, along with the three GCI-trained technicians working on-site. The team also conducted an initial analysis of the mosaic rapid survey data, completed earlier this year, and began discussions for creating a site-wide mosaic conservation plan. Trial wall repair treatments for the Maison de la Chasse were carried out, and mortar materials were collected for laboratory testing at the GCI. Field testing of different depths of reburial fills for moisture stability was begun, as was testing of a temporary covering material.

INTERNATIONAL COLLOQUIUM

In May 2013 the GCI, the Dunhuang Academy, and ICOMOS China organized a three-day colloquium at the Mogao Grottoes to discuss visitor management and tourism at heritage sites in China. The Mogao Grottoes, comprising nearly five hundred painted Buddhist cave temples cut into a cliff face, date from the fourth to fourteenth centuries. An indication of the site's significance is that it was among China's first group of nominations to the World Heritage List in 1987.

China's domestic and international tourism has reached unsustainable levels at many of its World Heritage sites. Because they are geographically remote, the Mogao caves had until recently escaped overwhelming tourism pressure. When they were opened in 1979

Long lines of visitors at the Mogao Grottoes, where the GCI has been working with the Dunhuang Academy on visitor management. Photo: Ding Xiaosheng.

there were 26,000 visitors. Visitors currently number nearly 800,000 annually, the great majority being Chinese. Most come from May through October, creating severe pressure on the site during peak holidays, when as many as 18,000 people may arrive on a single day. Normal summer daily visitation is from 3,000 to 6,000. The Dunhuang Academy, the statutory authority, has developed measures for visitor management that today comply with and even lead other sites in terms of standards for guide quality and professionalism.

To comprehensively address the site's mass tourism, the GCI and the Dunhuang Academy undertook a study of visitor carrying capacity in the context of a visitor management plan. From 2006 to 2012, extensive research, assessment, and testing were carried out to understand the relationship between visitors and wall paintings deterioration, to identify conditions limiting public visitation of grottoes, and to establish monitoring indicators. The academy is developing a new visitor center outside the site's boundaries, which will serve an orientation and interpretation function and help control visitor loads. As the point of departure, it will include virtual tours of caves that may not be open to the public or to all visitors.

The visitor management challenges faced at Mogao are mirrored at other heritage sites. It was in this context—and with an eye to increasing awareness in China of approaches to visitor management—that the partners conceived the colloquium. Case studies, including theoretical approaches and visitor flow modeling, were discussed.

EGYPTIAN PLASTERS RESEARCH

As part of a collaboration with Egypt's Ministry of State for Antiquities on projects in the Valley of the Queens and the tomb of Tutankhamen, GCI and Egyptian conservators and scientists have undertaken research on ancient Egyptian plasters. Research began in 2010 to develop treatments to conserve tomb wall paintings at these sites on the West Bank at Luxor. Many tombs that are part of the Theban Necropolis, a World Heritage Site, are in poor condition and require stabilization treatments to secure vulnerable painted plaster.

Modern plasters used to repair Egyptian wall paintings and monuments typically have contained cement and lime. However, these materials do more harm than good at sites such as the Valley of the Queens by contributing to wall paintings deterioration because of their hardness and low water vapor permeability. Compatibility between original materials and new repair is an important conservation principle.

To develop compatible repair materials, the team first focused on understanding the composition of the original plasters. Although the general belief is that Egyptian plasters are either gypsum- or earth-based, scientific analysis by GCI and Egyptian personnel tested this belief by studying a wide range of historic plaster samples and locally sourced raw materials. The results were surprising: the plasters were primarily composed of calcium carbonate with clays, sand, and small amounts of anhydrite. The plaster components closely matched a local soil, known in Arabic as *hiba*, an erosional deposit of the Theban Mountain that surrounds both the Valley of the Queens and the Valley of the Kings. Because of its clay content, hiba can be used as a plaster on its own or with minor modification. This commonly and locally available material was the predominant plaster used in the Valleys of the Queens and Kings and likely was used throughout West Bank sites.

Current research on Egyptian plasters has involved analysis of a wider range of hiba deposits from the area to assess compositional variation. The goal is to relate hiba deposits to the original plasters and to consider their modification by ancient Egyptians. While most historic plasters seem to be composed primarily of hiba, in some cases additional binders may have been added for extra adhesion and workability.

Based on this research, new repair plasters have been formulated, and final research will examine their compatibility and appropriateness compared to original plasters. Depending on test results, the plaster formulations may be modified to better match the properties of the original plasters. Stabilization with the final plaster mixture will be carried out during field campaigns. The GCI also plans workshops for Egyptian and foreign conservators working in the Luxor area in the analysis and characterization of historic plasters and the use of hiba-based repair plasters.

OUTDOOR PAINTED SCULPTURE

In June 2013 the GCI collaborated with the Modern Materials and Contemporary Art working group of ICOM-CC to organize at the Kröller-Müller Museum (KMM) in the Netherlands a meeting on conserving outdoor

Trowel I by Claes Oldenburg and Coosje van Bruggen, at the Kröller–Müller Museum. Art: © Claes Oldenburg and Coosje van Bruggen. Photo: Tom Learner, GCI.

painted sculpture. Nearly one hundred professionals attended.

Conserving outdoor painted sculpture can be challenging, given the uncontrolled and often harsh environments to which works are exposed. Yet collectors and artists often have the expectation that painted surfaces should remain pristine. Although conservation approaches for these sculptures exist, most involve major and costly interventions, such as full repainting of a work.

The meeting included eighteen talks covering technical and philosophical aspects, and case studies were presented on sculptures of influential artists working in this medium, including Calder, Dubuffet, Lichtenstein, Oldenburg, Di Suvero, and Tajiri. Three papers focused on works in the KMM collection, and participants visited the KMM sculpture park to view the works and discuss their conservation with the professionals involved. The meeting concluded with a panel discussion of conservators and representatives from the Dubuffet and Tajiri Foundations, as well as members of the paint industry; the discussion focused on identifying ways for conservators to work with artist foundations and industry. Meeting postprints are scheduled for publication in summer 2014. More information on the meeting is available at www.incca.org/opsmeeting2013.

The report of a related June 2012 meeting organized by the GCI at the Metropolitan Museum of Art in New York is now available online at www.getty.edu/conservation/our_projects/science/outdoor/outdoor_focus_mtg.html. The report addresses issues, responses, and priorities related to the conservation of outdoor painted sculpture.

EVALUATION OF LIME-BASED HYDRAULIC INJECTION GROUTS FOR CONSERVATION OF ARCHITECTURAL SURFACES

A Manual of Laboratory and Field Test Methods

This manual provides a set of procedures for the testing of lime-based hydraulic injection grouts for the conservation of architectural surfaces. It is meant as a reference for conservation scientists in the laboratory and conservators in the field to test, evaluate, and select appropriate injection grouts for the conservation of delami-

nated wall paintings, plasters, and mosaics on vertical and horizontal surfaces.

The information is based on the results of a GCI research project—Injection Grouts for the Conservation of Architectural Surfaces: Research and Evaluation—initiated in 2005. As part of the project, these laboratory and field testing procedures were developed to evaluate injection grouts specifically for architectural surfaces. The full suite of tests permits comprehensive evaluation of grout properties and performance when new grouts are developed, existing mixes are substantially modified, different formulations are compared, and individual properties for specific applications and field conditions are verified.

This volume is one of many GCI publications aimed at disseminating the results of Institute research to the conservation community. It is hoped that by providing scientists and conservators with reliable and comparable laboratory and field tests for the evaluation of injection grouts, this publication will advance conservation practice and lead to more informed conservation decisions. It is available at www.getty.edu/conservation/groutsmanual.

Recent Events

FOURTH CAPS WORKSHOP HELD

Ongoing GCI research into modern and contemporary art has contributed significantly to the understanding of acrylic paints and highlighted the difficulty conservators face when cleaning these materials. In response, the GCI has undertaken a series of workshops, "Cleaning of Acrylic Painted Surfaces" (CAPS), that address cleaning challenges through methodologies that can facilitate application and problem solving.

The fourth CAPS workshop, held in April at the Lunder Conservation Center in Washington, DC, began with an overview of current knowledge and recent advances in the cleaning of acrylic paints by the workshop instructors, all of whom are leading research in this area: Bronwyn Ormsby (Tate), Richard Wolbers (University of Delaware), Chris Stavroudis (independent conservator), and Tom Learner (GCI). Most of the workshop explored the formulation and use of a range of cleaning

systems, with the aim of understanding both theory and practice. To inform ongoing research, instructors asked participants for their impressions of the various cleaning systems used during the workshop.

CAPS is part of the GCI's Research into Practice Initiative, which seeks to facilitate the practical application of new research to conservation problems. Select teaching materials from the Lunder workshop will be available on the GCI website this fall. The next CAPS workshop will occur at the Art Gallery of New South Wales in Sydney, Australia, in December 2013. Future CAPS workshops are planned for Asia and Europe.

CONTEMPORARY ARCHITECTURE SYMPOSIUM HELD

On May 21 the GCI presented "Minding the Gap: The Role of Contemporary Architecture in the Historic Environment," a public symposium at the Getty Center that explored ways contemporary architects insert new buildings in historic urban areas to conserve the character and quality of the historic environment while potentially creating tomorrow's heritage.

The symposium began with a presentation by architectural critic Paul Goldberger, who looked at issues such as how respect for historic context is best expressed, and stressed that urban buildings are not just individual works of art but part of a city's larger composition. He was followed by renowned architects Rafael Moneo, Denise Scott Brown, Juergen Mayer H., Thomas H. Beeby, and Richard Rogers, who presented their own projects, demonstrating

a vast range of approaches to defining context and designing in the historic environment. Some of the architects also discussed earlier interventions in historic areas that influenced their own work.

The symposium was part of the GCI's Contemporary Architecture in the Historic Environment project. Future project work will include developing case studies and creating documents that address the challenges of designing and assessing the impact of new buildings in the historic environment. The symposium can be viewed in its entirety on the GCI YouTube channel: www.youtube.com/gettyconservation.

ADVANCED PHOTOGRAPHIC CONSERVATION WORKSHOP

In July 2013 the GCI organized a workshop titled "Conservation Strategies for Humidity- and Water-Damaged Photographic Materials." Held at the Croatian State Archives in Zagreb, this was the first of the Advanced-Level Photograph Conservation Workshops, a new series of annual two-week workshops. This series will focus on specific types of damage or deterioration, exploring the nature and mechanisms of the damage as well as appropriate treatments.

At the Zagreb workshop, participants were presented with an overview of current knowledge of humidity- and water-damaged photographic materials, with an emphasis on recent research. Most of the workshop was spent in the conservation lab, where participants undertook treatment strategies and evaluated their applicability and efficacy. Group discussions explored a range of subjects, including treatment

experiences, outstanding issues and problems for individuals and the field, and priorities for future workshops.

The workshop was led by Barbara Lemmen (Conservation Center for Art and Historic Artifacts in Philadelphia), Debra Hess Norris (University of Delaware), Jana Križanova (Academy of Fine Arts and Design in Bratislava, Slovakia), and Tram Vo (GCI).

2013 INTERNATIONAL STONE COURSE CONCLUDES

In June 2013 the Eighteenth International Course on Stone Conservation concluded in Rome. The twelve-week course—presented by the GCI in partnership with ICCROM and Rome's Non-Catholic Cemetery—brought together conservators, architects, conservation scientists, engineers, and archaeologists from nineteen countries to learn about theoretical and practical methodologies for stone conservation.

This is the third time that the GCI has partnered with ICCROM on the course. Using ICCROM's facilities, and taking advantage of Rome's architectural heritage and its legacy of conservation practice, the participants learned about all aspects of stone conservation, including the history and theory of conservation, material characteristics of stone, deterioration mechanisms and methods of survey and analysis, and conservation interventions and criteria for treatments. A fieldwork practicum at Rome's Non-Catholic Cemetery, along with a study tour of conservation projects in Florence, Carrara, Parma, and Venice, offered opportunities to learn hands-on conservation techniques and best practice.

Building on the experiences of the previous courses, the 2013 course addressed the evolving needs of conservation professionals and provided them with a platform for exchanging ideas about conservation practices. Based on course evaluations, the curriculum will be refined to reflect the latest advances in stone conservation practice. The next International Course on Stone Conservation is planned for spring 2015.

SECOND LACQUERS WORKSHOP

In July 2013 the GCI and the Yale Institute for the Preservation of Cultural Heritage welcomed scientists and conservators from the

The evening panel discussion at the GCI's "Minding the Gap" symposium at the Getty Center. Photo: Anna Flavin, GCI.

Participants in the International Stone Course engaged in plant removal and documentation at the historic Non–Catholic Cemetery in Rome. Photo: Benjamin Marcus, GCI.

United States, France, and Brazil to a five-day workshop, "Recent Advances in Characterizing Asian Lacquer." The workshop, held at Yale's Center for Conservation and Preservation, aimed to disseminate new tools and procedures for uncovering detailed information about lacquered objects; it was developed as part of an ongoing research project undertaken by the GCI and the Getty Museum. During the workshop, scientists and conservators worked in research teams to study historic lacquer samples from their own collections, putting new techniques into practice. They then presented their findings to the group.

Michael Schilling, a GCI senior scientist, and Arlen Heginbotham, a Getty Museum associate conservator—along with Nanke Schellmann of Vienna's Academy of Fine Arts—presented an integrated set of complementary high- and low-tech tools for characterizing Asian lacquers. Daisy Wang of the Freer and Sackler Galleries and GCI visiting scientist Julie Chang, both of whom are conducting research into historical Chinese literature on lacquer, contributed valuable insights into lacquer manufacture and traditions.

Future workshops are planned for Paris and Beijing. The workshop series supports a growing international community of lacquer researchers and is organized as part of GCI Education's Research into Practice Initiative.

Upcoming Events

SCHOLAR APPLICATIONS NOW BEING ACCEPTED

The GCI Conservation Guest Scholar program provides an opportunity for conservation leaders to pursue research that advances conservation practice and contributes new ideas to the field. Successful candidates are in residence at the Getty Center for periods of three, six, or nine months and are chosen by a professional committee through a competitive process. For information on the program and on applying, visit the Guest Scholars link on the GCI home page (getty.edu/conservation). The 2014–15 Conservation Guest Scholar program application deadline is November 1, 2013.

2013–14 CONSERVATION GUEST SCHOLARS

David Bourgarit, Head of the Metal Group. Centre de Recherche et de Restauration des Musées de France, Paris. "A technical database on French bronze sculpture: Design and data analysis." *April–June 2014*

Francesca Merrick Esmay, Conservator, Panza Collection. Solomon R. Guggenheim Museum, New York. "Research on the methods and materials of two American artists: Dan Flavin (1933–1996) and John Chamberlain (1927–2011)." *January–March 2014*

Filiz Kuvvetli, Senior Conservator. The Art Conservation Center, Copenhagen, Denmark. "The color of Functionalism." *January–March 2014*

Ruven Lucio Saravana Pillay, Research Scientist. Centre de Recherche et de Restauration des Musées de France, Paris. "Computational image analysis and visualization for art conservation." *April–June 2014*

Paul Schwartzbaum, Independent scholar. Formerly Senior Technical Advisor and Conservator for Museum Construction and Overseas Exhibitions, Guggenheim Foundation, New York. "The history and potential downside of preventive conservation in the exhibition of works of art." *September–December 2013*

Marianne Elizabeth Webb, Conservator. Webb Conservation Services, Halfmoon Bay, British Columbia, Canada. "Understanding the discoloration of Asian lacquer." *January–June 2014*

Gregory Cyril Young, Independent scholar. Sydney, Australia. "Building capacity in cultural sustainability: A shared model for conservation, sustainability, and culture." *April–June 2014*

GRADUATE INTERN PROGRAM

Applications are now being accepted for the 2013–14 Getty Graduate Internship Program. These are full-time positions for students who intend to pursue careers in fields related to the visual arts. Programs and departments throughout the Getty provide training and work experience in areas such as curatorship, education, conservation, research, information management, public programs, and grant making.

The GCI pursues a range of activities dedicated to advancing conservation practice, in order to enhance the preservation, understanding, and interpretation of the visual arts. Twelve-month internships are available in the GCI's Education, Field Projects, and Science departments.

Instructions, application forms, and additional information are available online in the "Funding Priorities, Leadership" section of the Getty Foundation website. For further information contact the Getty Foundation at gradinterns@getty.edu. The application deadline is December 2, 2013.

2013–14 GCI GRADUATE INTERNS

Julie Shih Chu Chang
University College London
China Principles, Wall Paintings at Mogao Grottoes, and Characterization of Asian and European Lacquers

Mesut Dinler
Middle East Technical University, Ankara
Conserving Modern Architecture Initiative

Annabel Lee Enriquez
University of Southern California
Arches Project

Elena Macchioni
University of Genoa, Italy
Earthen Architecture Initiative

José Santiago Pozo-Antonio
University of Vigo, Spain
MOSAIKON: Alternative Backing Methods and Materials

Samuel Edward Whittaker
Courtauld Institute of Art, London
Conservation and Management of the Tomb of Tutankhamen

Staff Updates

GIACOMO CHIARI RETIRES

Photo: Dusan Stulik, GCI

In September, GCI Chief Scientist Giacomo Chiari retired after serving for over ten years as the head of GCI Science.

Giacomo arrived at the Institute in 2003 from the University of Turin, where he was a full professor in applied mineralogy. While he was there, his research initially focused on crystallography, but over time his professional interests expanded to include science and cultural heritage conservation. After receiving a major grant for a cultural heritage project in 1988, he devoted himself full-time to conservation-related activities, which included a study of Maya blue that identified the pigment's compounds and geographic distribution. His research also included earthen architecture and treatments for decorated surfaces. Prior to joining the GCI, he spent the summer of 2001 at the Institute as a GCI Conservation Scholar.

As chief scientist, Giacomo not only oversaw GCI Science but also participated directly in scientific research. Besides serving as project leader for the Organic Materials in Wall Paintings project, he was part of a number of projects as a team member or adviser, including GCI's initial work at Herculaneum and research into injection grouts, desalination of porous building materials, and mosaics. In addition, he explored ways to enhance scientific instrumentation used in conservation. He spearheaded a cooperative venture to design and build a portable, non-invasive XRD/XRF that improved the quality of information obtainable from an art object without invasive sampling. He began the use of laser speckle interferometry in GCI projects to detect the presence of voids in walls due to delamination. And during his tenure, a computer tomography scanner was constructed at the GCI to record the interior details of small bronzes and sculptures. In addition, Giacomo modified the technology for imaging Egyptian blue pigment on mural paintings and ancient statues, making it portable; this technology was applied in work at Herculaneum and the tomb of Tutankhamen. He was also instrumental, over the last four years, in arranging for young graduate scientists from the University of Turin to spend a year working in the GCI laboratories. Another of his achievements was securing for the GCI Reference Collection a donation from retired University of Palermo professor Rosario Alaimo of over seven hundred fully documented and analyzed limestone and marble samples from all the known ancient quarries in Sicily.

In 2012 Giacomo was awarded a silver medal by the environmental and cultural heritage division of the Italian Chemical Society for his research in the field of cultural heritage.

While Giacomo has retired from the GCI, he plans to maintain his connection to conservation and to continue to carry out research related to the field. His GCI colleagues will very much miss regular contact with his humor, warmth, humanity, and passion for the task of conserving cultural heritage.

Publications
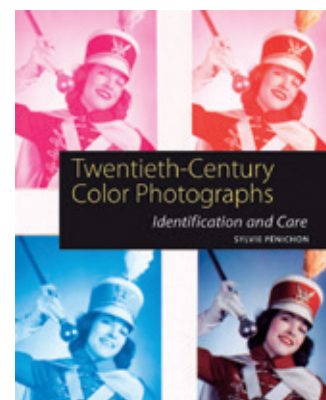
Twentieth-Century Color Photographs
Identification and Care
By Sylvie Pénichon

With the advent of digital imaging, the era of traditional color photography is coming to an end. Yet more than 150 years after the invention of color photography, museums, archives, and personal collections are full of images to be cherished, studied, and preserved. These photographs, often made with processes and materials no longer used or easily identified, constitute an important part of twentieth-century heritage. Today it is more important than ever to capture the technical understanding of the processes that created these irreplaceable images.

In providing an accessible overview of the history and technology of the major traditional color photographic processes, this well-illustrated volume promises to become the standard reference in its field. Following an introductory chapter on nineteenth-century color photography, seven chapters discuss the most commercially or historically significant processes of the twentieth century—additive color screen, pigment, dye imbibition, dye coupling, dye destruction, dye diffusion, and dye mordanting and silver toning—offering readers a user-friendly

guide to materials, methods of identification, and common kinds of deterioration. A final chapter presents guidelines for collection management, storage, and preservation. There are also a glossary of technical terms and appendixes presenting detailed chronologies for Kodachrome and Ektachrome transparencies, Cibachrome/Ilfochrome printing materials, and Instant films.

Sylvie Pénichon is a conservator of photographs at the Amon Carter Museum of American Art in Fort Worth, Texas.

The Conservation of Cave 85 at the Mogao Grottoes, Dunhuang
A Collaborative Project of the Getty Conservation Institute and the Dunhuang Academy
Edited by Lori Wong and Neville Agnew

The Mogao Grottoes, a World Heritage Site in northwestern China, are located along ancient caravan routes—collectively known as the Silk Road—that once linked China with the West. Founded by a Buddhist monk in the late fourth century, Mogao flourished for a millennium as monks, local rulers, and travelers commissioned hundreds of cave temples cut into a mile-long rock cliff and adorned them with vibrant murals. More than 490 decorated grottoes remain, containing thousands of sculptures and some 45,000 square meters of wall paintings, making Mogao one of the world's most significant sites of Buddhist art.

In 1997 the GCI, which had been working with the Dunhuang Academy since 1989, began a case study using the Late Tang dynasty Cave 85 to develop a methodology for stabilizing deteriorating wall paintings. This thoroughly illustrated volume is the definitive report on the project, completed in 2010.

Lori Wong is a wall painting conservator and project specialist at the GCI. Neville Agnew,

a GCI senior principal project specialist, is coauthor of *Cave Temples of Mogao: Art and History on the Silk Road* (Getty Publications, 2001) and editor of *Conservation of Ancient Sites on the Silk Road* (Getty Publications, 2010).

Conservation Practices on Archaeological Excavations
Principles and Methods
By Corrado Pedelì and Stefano Pulga, translated by Erik Risser

The relationship between archaeology and conservation has been complex and, at times, challenging. Archaeologists are often seen as interested principally in excavation and research, while conservators are concerned mainly with stabilization and the prevention of deterioration. Yet it is often initial conservation in the field that determines the long-term survival and intelligibility of both movable artifacts and fixed architectural features.

This user-friendly guide to conservation practices on archaeological excavations covers both structures and artifacts, starting from the moment when they are uncovered. Individual chapters discuss excavation and conservation, environmental and soil issues, deterioration, identification and condition assessment, detachment and removal, initial cleaning, coverings and shelters, packing, and documentation.

Corrado Pedelì is senior conservator/restorer with the Superintendence for Cultural Heritage of the Aosta Valley Regional Administration in Italy. Stefano Pulga is a freelance restorer based in Aosta. Erik Risser is assistant conservator in the Department of Antiquities at the J. Paul Getty Museum.

These publications can be ordered online through the Getty Museum Store (shop.getty.edu).

For more information about the work of the GCI, see getty.edu/conservation and

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A close view of the Avebury World Heritage Site as it would appear in the Arches system, with icons identifying the various known heritage resources spanning many historical periods. Image: © 2013 Google Map Data.