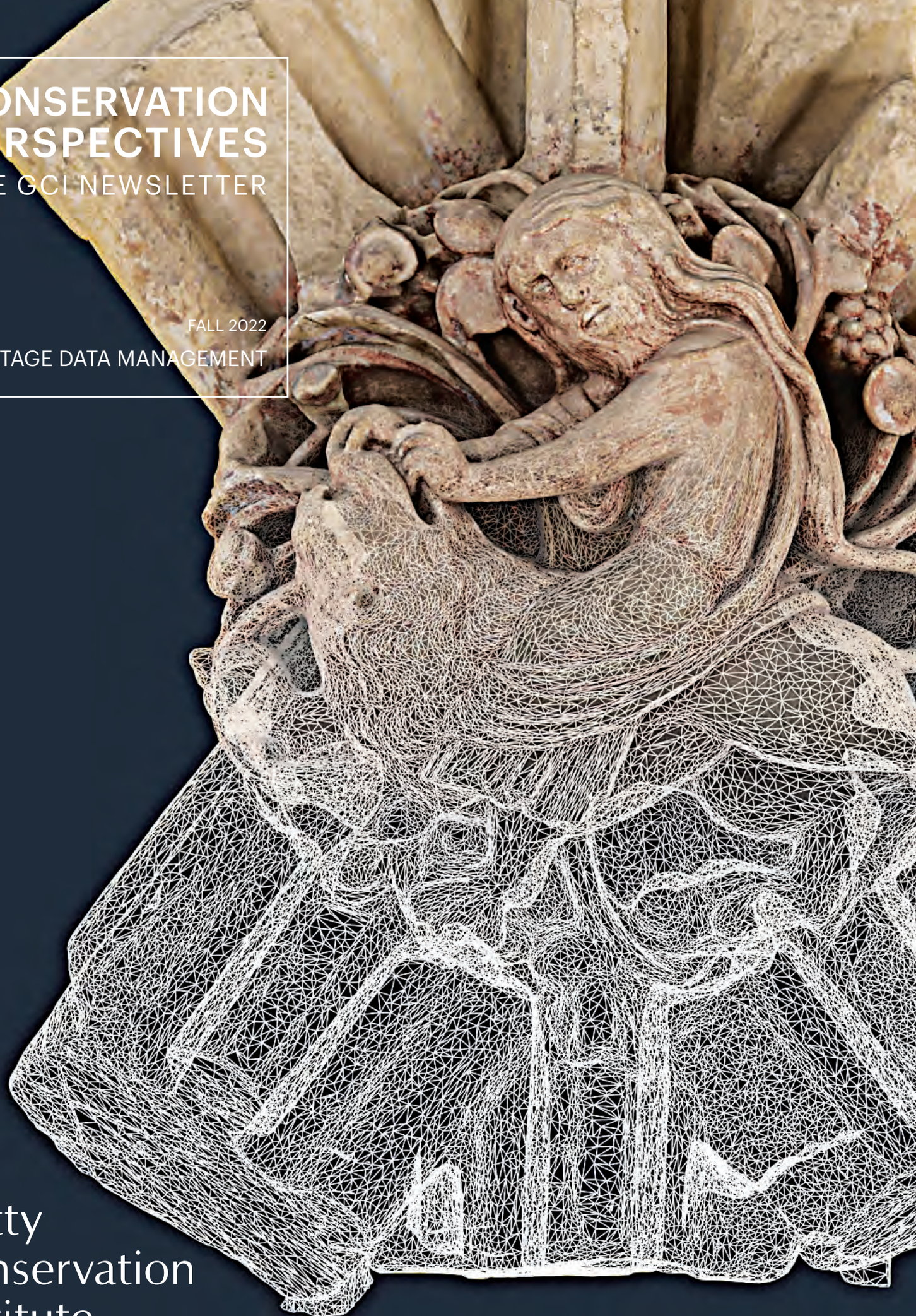
CONSERVATION PERSPECTIVES

THE GCI NEWSLETTER

FALL 2022

HERITAGE DATA MANAGEMENT



Getty Conservation Institute

A Note from the Director

Photo: Anna Flavin, GCI.

The presence of data in digital form is inescapable in our lives. Data permeates the work we do, the way we communicate, the information we seek, the way we create, and even our shopping. It is a kind of invisible infrastructure, shaping the contours of our world and underpinning the choices we make, personally and professionally.

Digital data is now also integral to cultural heritage conservation. Documentation, assessment, monitoring, analysis, planning, and interventions all involve digital data to one extent or another. Cultural heritage data, like many other categories of data, needs to be managed, exchangeable, and usable well into the future. The ironic reality is that data connected to a field devoted to preservation is itself at risk of being lost—or, even if retrievable, still lost in the sense of being unreadable.

About a decade ago, the GCI, working with the World Monuments Fund, formed the Arches project to embark on development of an open-source data management platform designed to meet the needs of cultural heritage organizations across the globe while sustaining data in the long term. The Arches software platform, now utilized by dozens of heritage organizations around the world, continues to be extended and refined, and that work prompted us to explore in *Conservation Perspectives* important issues and practices related to heritage data management.

In the feature article, Eric C. Kansa, a data management expert who trained as an archaeologist, calls for making effective data management policies a priority—policies and practices that can ensure that the work of cultural heritage organizations and professionals has lasting value. In their article on the Arches project itself, Alison Dalgity, David Myers, and Catherine Schmidt Patterson describe the development, capabilities, and widespread use of the platform. (These three GCI staff members also worked with *Conservation Perspectives* editor Jeffrey Levin as guest coeditors on this edition.)

Holly Wright, the International Projects Manager for the Archaeology Data Service (founded in 1996), describes the core activity of her organization, which is the long-term digital preservation of the archaeological data generated through academic research, development-led commercial work, and community projects in the United Kingdom. In the last of our articles, archaeologists Ramona Nicholas and Neha Gupta explore the need to advance Indigenous sovereignty over the collection, use, and management of Indigenous data, including cultural heritage data. Finally, in our roundtable discussion, three heritage professionals—Mahmoud Abdelrazek, Joe Padfield, and Mario Santana-Quintero—describe what they see as some of the main challenges for the conservation field in the creation and management of digital data.

I want to close by welcoming the new president and CEO of the J. Paul Getty Trust, Katherine "Katy" Fleming, previously the provost of New York University, as well as the Alexander S. Onassis Professor of Hellenic Culture and Civilization and Professor of History and Hellenic Studies at NYU. You can read more about her background in the GCI News section (see p. 26) of this edition of *Conservation Perspectives*.

Timothy P. Whalen
John E. and Louise Bryson Director

CONSERVATION PERSPECTIVES

Contents

HERITAGE DATA MANAGEMENT

THE GCI NEWSLETTER
VOLUME 37 • NUMBER 2 • FALL 2022

ON THE COVER
A 3D model using photogrammetry of the Hailes Abbey architectural boss depicting Samson wrestling a lion. The software performs data processing that interpolates the space between points to generate a network of triangulated lines between points, which is called a 3D mesh. Image: Courtesy of Historic England.

Read this issue and more online at **getty.edu/conservation**.

THE GREAT DIGITAL LOST AND FOUND

BY ERIC C. KANSA

The US National Aeronautics and Space Administration (NASA) is one place where the quip "it's not rocket science" falls a little flat. But even NASA has a troubled history with the long-term management of digital data.

Established in 1958, NASA was an early adopter of digital computers, a development dramatized in the 2016 movie *Hidden Figures*. Throughout the 1960s and 1970s, NASA increasingly relied on digital (as opposed to human) computers in almost every aspect of their missions. During this period, human space missions, Earth monitoring satellites, and probes to the Moon, Mars, and beyond all generated tremendous amounts of data from a dizzying array of scientific instruments.

NASA's early missions are now part of the historical record. As Alice Gorman[1] highlighted, the first robotic and human landings on the Moon are old and significant enough to qualify as cultural heritage sites. The data associated with these early space missions are integral to understanding humanity's first tentative steps off our home planet.

Like many organizations, NASA initially gave little thought to the long-term management of digital data. Early missions ran

1. Alice Gorman, *Dr Space Junk vs The Universe: Archaeology and the Future* (Cambridge, MA, and London: MIT Press, 2019).

Challenges and Possibilities in Managing Cultural Heritage Data

Our currently active networked file systems and our own hard drives can seem like the warehouse at the end of the film *Raiders of the Lost Ark*, where things enter a vast purgatory of un-curated storage inevitably to be lost and forgotten. Image: Courtesy of Lucasfilm Ltd. Copyright and trademark notice: *Raiders of the Lost Ark*™ & ©Lucasfilm Ltd. All rights reserved. Used under authorization. Unauthorized duplication is a violation of applicable law.

on customized and often undocumented software and platforms created by engineers who have long since retired. Hundreds of thousands of magnetic tapes and other storage media degraded over time in neglected storerooms. Even if bits and bytes could be extracted from these obsolete media, their meaning might be totally obscure. "Metadata" documentation (sometimes as inadequate as a few handwritten letters scrawled on a tape's canister) easily gets lost or makes little sense to future readers. Recovering even a sample of these historically unique data often requires costly and painstaking detective work.[2]

Data curation problems are not unique to NASA. Cultural heritage conservation organizations, working in a sector professionally interested in lengthy time horizons, also struggle with long-term data management. Many offices may still store boxes of CD-ROMs, floppy disks, and Zip drives (remember those?), all in various states of decay and obsolescence. Even our currently active networked file systems and our own hard drives can seem like the warehouse at the end of the film *Raiders of the Lost Ark*, where things enter a vast purgatory of un-curated storage, inevitably lost and forgotten.

CULTURAL HERITAGE CONSERVATION AND DATA

If you make a career out of data curation, it's an absolute struggle to make it sound interesting. Few people want to hear about such things as the significance of file naming conventions, metadata standards, open formats, and identifier policies. If you raise the topic, even your most patient friends will likely search for an excuse to discuss almost anything else—or look for the exit!

Data creation, management, and curation are integral to everything we regard as important or interesting in our work. Digital data now permeate nearly every institution and decision-making process. Cultural heritage conservation organizations use data for baseline recording, assessment and monitoring, planning and

2. Sandra Blakeslee, "Lost on Earth: Wealth of Data Found in Space," *The New York Times* (March 20, 1990). Archived from the original on November 9, 2012. Web Archive: https://web.archive.org/web/20121109203504/http://www.nytimes.com/1990/03/20/science/lost-on-earth-wealth-of-data-found-in-space.html

prioritizing resource allocation, and informing interventions. These data feed models and simulations for long-range forecasting, especially to understand how climate change will reshape environments, coastlines, and land uses, including cultural places and objects.

All these uses of data are shaped by complex technical and institutional factors. Cultural heritage conservation doesn't happen in isolation. People, plans, and interventions need to be coordinated within and between organizations. That coordination often involves data exchange among groups running different kinds of software on different kinds of computing environments.

Enabling information flows across different computing platforms is called "interoperability." Interoperability may seem like a geeky, technical concern with little relevance for cultural heritage conservation, but don't be fooled! Interoperability is a strategic matter. Institutions often must migrate data from one platform to a new one, exchange data with a partner, and make data usable for decades into the future. These tasks all fall under the umbrella of "interoperability."

A lack of interoperability reduces an organization's capacity to adapt and change to meet new needs. "Lock-in" commonly describes this kind of dire situation when key data gets trapped in a proprietary system so it can't be used where it's currently needed. Measures that promote interoperability enable organizations to fully use, shape, and move their own data to meet changing usage. Interoperability mitigates the risk of lock-in.

Interoperability sounds great—but how do you achieve it? A large part of the answer comes down to standards, especially "open" (not proprietary) standards. Open standards set common expectations for how information is recorded and transmitted. They allow different software applications to read and write the same data files, even if the software is created by different companies, in different programming languages, and runs on different operating systems (e.g., Windows, Android, iOS, or Linux). Open standards help preserve choice, allowing you to move data to work where it's needed. Open standards also help preserve information, because data saved in a widely used open standard is much more likely to be readable on future computing platforms.

INSCRUTABLE INFORMATION

Have you ever read a social media post where someone used an abbreviation, and you had no idea what it meant? If you've experienced this confusion, welcome to the club. The problem is systemic in cultural heritage data management. While open formats work toward interoperability and data preservation, you still may find yourself in a situation where you can open and read a file, but the file's content is unintelligible. Just being able to open and read a data file doesn't mean you can understand and use the file's information.

The cultural heritage domain involves some uniquely challenging information management issues. It encompasses a dizzying diversity of topics in which one may use data to model and

A total station collecting spatial data in the tomb of Nefertari in Egypt. A total station is an electronic/optical instrument used in surveying and just one of the many tools available to create data. Photo: Carleton Immersive Media Studio, ©The J. Paul Getty Trust.

document everything from architectural styles to historical events and people, time periods, excavations and surveys, artifacts, curation and conservation interventions, laws and regulatory systems, notions of significance, descendant community[3] perspectives, geography, and climate. Some information may be local in scope, and some may be documented at a large international scale. Some data are highly geospatial in nature, some may require narrative documents, and some may be expressed as images or even 3D models. The scale, complexity, and diversity of information in cultural heritage can seem overwhelming!

Organizations can have difficulty maintaining the contextual integrity of their vast and complex collections of information. Data are often created according to improvised and poorly (if at all) documented coding systems that record different classification terms. Imagine how hard it could be to decode the terse abbreviations in a sprawling spreadsheet created by a retired colleague. Do the letters "IDK" mean the same thing as "idk," or was one instance a typographic error?[4] Some of those coding systems may not meet current needs (and may even contain racist or otherwise problematic terminologies) and yet may be costly and difficult to change because they're "baked into" legacy systems.

3. A "descendant community" can be defined as a group of people who hold elements of cultural heritage as important because of ancestral ties or because of other historical, religious, or social connections.

4. Some organizations, including the Getty Conservation Institute, have developed data policies and procedures that provide clear guidelines on everything from file naming conventions to uses of common abbreviations. Clear and simple guidance like this can help reduce doubt and uncertainty among different colleagues working within an organization when needing to create and understand data.

In addition, naming and identifier practices can be haphazard, so that related information in different spreadsheets, databases, and documents cannot be easily discovered, cross-referenced, and used. Many data are created using general purpose software tools, especially spreadsheets. Spreadsheets often don't provide easy-to-use support for keeping information consistent ("data validation"), so data quality can suffer. People making the data may lack training or experience in managing data and may use color and other kinds of presentation formats to express significant attributes of data. Using different colors and fonts in this way vastly complicates interoperability.

In order to keep things simple and straightforward, many open data formats well suited for interoperability do not carry stylistic information. For example, if you save an Excel workbook elaborately styled with different colors and fonts as a CSV file so it can be loaded into a geographic information system (GIS) or database, all color and font information will be lost. That's why it's important *not* to use stylistic characteristics to describe important attributes of your data.

Given the complexity of cultural heritage data, and the fact that few cultural heritage professionals receive formal training in data management, much of our data may be extraordinarily cumbersome to use even now. Sadly, they will be much less usable in the future.

FAIR DATA AND "RELATIONAL THINKING"

What frameworks should guide cultural heritage data management? For an answer, we can turn to the current consensus within communities that curate and use scientific and research data. Scientists and other researchers, including investigators in the humanities, continually create and use data. These communities, together with colleagues in the library and information sciences, recently identified key aspects of good data practice as the "FAIR Principles." FAIR stands for "Findable, Accessible, Interoperable, and Reusable."

The FAIR Principles highlight how data should be portable across software or computing systems. They also emphasize how discovery, access, and reuse need to be valued. In order to promote discovery, access, and reuse we need to apply some "relational thinking." What connections and potential connections may people want to make across information resources? How do you make those connections easier to build and maintain across different computing environments and different professional and organizational settings? In that sense, finding ways to empower people to reuse information in different settings is at the core of good practice. In the cultural heritage context, these information flows can foster collaborations and outcomes as diverse as:

- conservation and protection;
- public education, including exhibitions;
- research and analysis, including archaeological and historical studies, as well as cultural heritage conservation and management topics;
- news, current events, and social media;
- commercial interests;
- new creative expression (arts and media, including gaming);
- advocacy and support.

Achieving these outcomes entails FAIR data and relational thinking, since they require the capacity to find, understand, repurpose, and recombine digital data from multiple sources. For example, some elements of cultural heritage data developed for heritage conservation and management purposes can be repurposed for public education.[5] The ability to include images and information about cultural significance (such as important historical events and people) in an online map can be made available to neighborhood associations and schools to develop walking tours. The same data can be combined with interviews, Wikipedia entries, and more, helping to tell new and richly textured stories about historical places.

FAIR Principles and thinking relationally aid organizations in avoiding common information dysfunctions, especially the tendency to build information silos. Information silos are systems with poor interoperability and little capacity to connect to anything else. Because they're designed for specific purposes and as isolated systems, they tend to be rigid and brittle (prone to fail if circumstances change), making it difficult to repurpose their data to respond to new needs and opportunities.

The FAIR Principles help people and organizations avoid the constraining traps of silos. Asking how information in one system, for instance a GIS, can connect to another system—such as a digital repository of reports—can make the whole greater than the sum of the parts. The richer the connections between these systems, the greater the potential benefits. If places discussed

A pile of discarded hard drives. Good data management includes care for the physical infrastructure and media on which data is stored, along with considerations of data format and standards, accessibility, and interoperability. Photo: Getty Images, ©Diane Collins and Jordan Hollender.

5. See this example (https://doi.org/10.6078/M7JM27R2) of linking State Historic Preservation Office (SHPO) datasets documenting archaeological sites with academic publications, datasets in digital repositories, and US Federal government documents.

in reports are cross-referenced with places documented by the GIS, then the GIS can power a rich geospatial search interface for the reports.

Information in one data source can help provide metadata, context, and meaning for related information in another data source, and vice versa. To enable such rich connections and turn FAIR Principles into a practical reality, organizations need to plan how to name and identify important pieces of information in ways independent of specific software or information systems. "Referential integrity" is a term used by database developers to describe the validity of links that cross-reference records stored in different collections of data. In practice, matches between identifiers provide the basis for such connections. In relational databases, these links occur between "keys" (identifiers) for rows in different tables. If references in such links are broken, then these references lack "referential integrity," and our documentation of context breaks down. To promote referential integrity, identifiers need to be globally unique, so they never repeat in ways that lead to ambiguity—and they need to be maintained and persistent, so that they are usable in the future. If you pardon the pun, the *key* to referential integrity is good identifier management.

Identifiers used across platforms and that have institutional backing represent "relational thinking" (the "findable" and "reusable" parts of FAIR) in action. More relational thinking needs to be adopted at an institutional and individual level. As individuals, we should carefully consider what items in our spreadsheets and databases may link to relevant information elsewhere. The more we add to our own data clear and unambiguous identifiers that express those relationships, the more context we provide.

Clapham Junction railway station in Britain. As the railroad industry realized over 150 years ago, the key to widespread transport of goods and people is standardization. While data standards similarly contribute to efficient interoperability, data management practices require an ethical foundation of meaningful engagement with communities and cultures related to heritage data. Photo: mattbuck. Licensed under the Creative Commons Attribution-ShareAlike 3.0 Unported license.

Examples of scientific data collected on a museum object and some of the equipment used to collect that data. Seen here are various images, XRF spectra and element distribution maps, Raman spectra, and a data visualization of *The Martyrdom of Saint Lawrence*, Pacino di Bonaguida, about 1340. Tempera and gold leaf, Leaf: 19 × 20.8 cm (7 1/2 × 8 3/16 in.). The J. Paul Getty Museum, Los Angeles, Ms. 80b, verso, 2006.13.verso. Photo: Catherine Patterson, GCI, ©The J. Paul Getty Trust.

Identifiers express and enable connections across datasets and make it easier to repurpose and reuse information. The World Wide Web has excellent examples of relational thinking working at a global scale. Collaborative projects like Pelagios[6] promote a simple set of common methods and standards to link together disparate cultural heritage datasets, documenting archaeological sites, objects in museum collections, digitized ancient documents, and databases of historical people and places. The globally unique persistent identifiers behind Pelagios help make sense of these vast cultural heritage collections so that they can be used for research and teaching.

CAREFULLY FAIR: TOWARD COMMUNITY-CENTERED DATA

Thus far, this article has maintained a *fairly* (pun intended) narrow focus on technocratic data concerns. The FAIR Data Principles, together with "relational" perspectives that promote connections and potential connections between different datasets, aim to make data easier to adapt to serve new needs. While these are excellent goals, they're incomplete—especially in the context of cultural heritage. Efficient interoperability and data reusability can have important benefits. But those benefits will not automatically be shared equitably.

We need more inclusive thinking about data, especially in how data reflect the interests of our stakeholders. Conservation takes place in a complex social landscape, often shaped by legacies of colonialism, racism, and other structural inequalities. We have ethical responsibilities to challenge those inequities. Created by a collaboration of information ethicists, human rights lawyers, Indigenous community leaders, and anthropologists, the CARE Principles for Indigenous Data Governance aim to codify modes of conduct that make data inclusively empowering.[7]

6. https://pelagios.org/
7. See: https://www.gida-global.org/care

CARE stands for "Collective Benefit, Authority to Control, Responsibility, and Ethics." The CARE Principles require us to understand that data are not ethically or culturally neutral. Most societies have rules and laws about the handling of different kinds of information, and these vary across the world. In the United States, for example, medical history data about individuals have strict and legally enforced privacy regulations. But the European Union has many more regulations regarding personal Internet usage data than the United States. Notions of privacy, what is and is not regarded as sensitive, what may be sacred, and what should be disclosed all vary by situation and cultural setting.

This diversity in regulation makes cross-cultural data governance complex. One shouldn't presume to know what information may be sensitive for a specific community without asking. To build such understandings, the CARE Principles highlight the ethical necessity of forging partnerships with descendant communities. While these principles aim to advance the self-determination and innovation rights of Indigenous peoples, they can and should be extended to promote the interests of other communities challenged by structural inequalities. Such partnerships are exactly the types of relationships we need to meet our wider ethical goals, even outside of data management.

The developers of the CARE Principles highlight how they complement FAIR Data Principles. Many practices that promote FAIR data also serve CARE data needs. For example, for data to be "reusable," the data need to be well documented and understood. Metadata that describes the data, who created it, why, and what different data attributes mean all promote such understanding. Similar metadata can document CARE data needs, describing what attributes may be sensitive (and for whom), what communities should be recognized, and expectations for how the sharing of benefits should unfold. Similarly, the use of globally unique and persistent identifiers can help express aspects of the contextual integrity of data, enabling one to trace linkages between specific elements of data and the ethical responsibilities associated with these data.

Some rock art—prehistoric cultural heritage "data"—has lasted tens of thousands of years. How long will the cultural heritage data of our time last? And while much rock art has endured, its meaning is not necessarily clear. If our cultural heritage data endures, will its meaning be clear? Image source: https://dataedo.com/cartoon. Licensed under a Creative Commons Attribution-NoDerivs 3.0 license.

CONNECTING INFORMATION AND COMMUNITIES

Data management is clearly a challenge for cultural heritage specialists. The complexity, variety, and scale of our data impose extraordinary demands on us, especially as we strive to meet our ethical responsibilities.

As highlighted here, data management needs to be a priority. Without more effective forms of data management, we will be poorly equipped to achieve any other goal. Simply put, bad data management detracts from our mission as time and resources are wasted on messy spreadsheets, lost documentation, cumbersome and inadequate databases, and costly lock-in with software vendors. Underinvesting in data management leaves us vulnerable to redoing and duplicating work, and making inadequately informed decisions and interventions, all ultimately leading to poorer conservation outcomes. Good data management is about ensuring that our work as cultural heritage organizations and professionals has lasting value. Additionally, it builds connections, both across datasets as emphasized by the FAIR Principles, and across communities as emphasized by the CARE Principles. Building these connections helps make other aspects of cultural heritage conservation more effective and more collaborative.

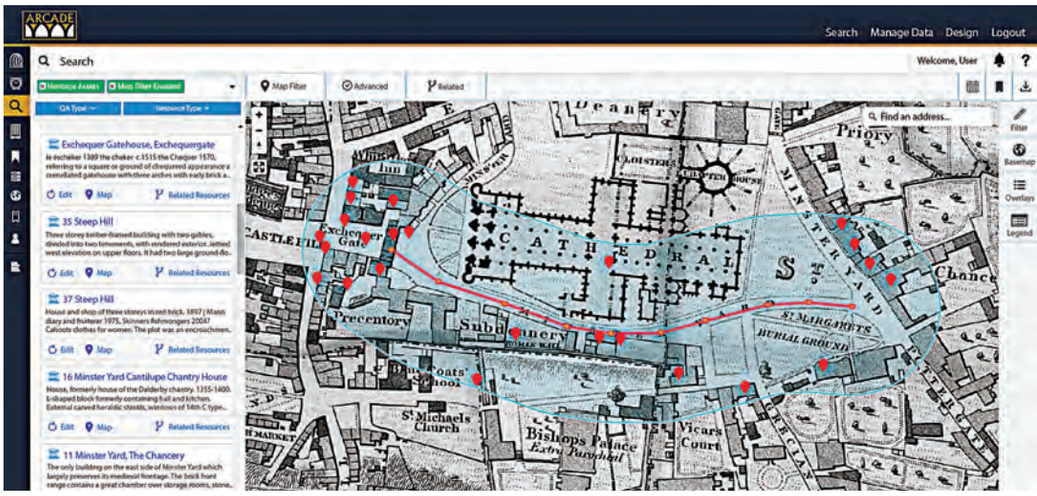
This article has purposefully ranged from NASA's magnetic tapes to GIS interoperability, from color-coding spreadsheets (please don't do that!) to European Union regulatory policies, and more. These topics illustrate how data management touches on physical infrastructure and media, software support for open formats and standards, and the social and ethical responsibilities around data. Ignoring infrastructure, data interoperability, and ethical needs risks profound failures. Without adequate data management investments now—including good data creation practices—we will leave a legacy of debt and doubt in which our future colleagues and even our future selves will labor under mountains of poorly organized and poorly described information. If one seriously considers the risks of what will be forgotten and what legal and ethical obligations may be broken, then good data creation and management practices no longer seem tedious and dull—they become immediate and urgent.

Eric C. Kansa—who has a PhD in anthropology and archaeological field experience in the Near East, Egypt, Italy, and North America—is program director for Open Context, which explores research data informatics, research data policy, ethics, and the technical aspects of data publishing and archiving. In addition to authoring this article, he assisted in the development of this Conservation Perspectives *edition.*

THE ARCHES PLATFORM

Bridging Heritage Pasts and Data-Rich Futures

BY ALISON DALGITY, DAVID MYERS, AND CATHERINE SCHMIDT PATTERSON



Using the Location Filter in Arches, users can spatially query data by drawing a line or an area and specifying a buffer size, viewed here over an underlying 1842 base map. This search functionality may be used to identify heritage resources that would be impacted by proposed development projects in this example from the City of Lincoln Historic Environment Record (HER) deployment of Arches. Graphic: Getty Conservation Institute.

CULTURAL HERITAGE DATA BY ITS VERY NATURE IS largely subjective, frequently incomplete or imprecise, and typically changes over time. These and other characteristics make it challenging to manage, even with the most modern and sophisticated digital systems. Moreover, public heritage organizations charged with the protection of our cultural heritage—and, of course, knowledge *about* that heritage—are notoriously underfunded worldwide, often lacking the resources and technical expertise needed to develop effective data management systems. This often results in the use of proprietary software never intended for the heritage field. Because of the commercial origin of such software, organizations may find themselves and their data locked into ongoing licensing fees and maintenance contracts. Organizations that create their own systems tend to end up reinventing the wheel by developing custom systems that share features with systems already developed. In addition, heritage organizations are sometimes forced to continue using outdated software, which not only is incompatible with other systems, but eventually renders the managed data inaccessible and therefore unusable.

After years working jointly in this domain, the Getty Conservation Institute (GCI) and World Monuments Fund (WMF) recognized the need to address these and related challenges. Inventories of heritage places such as archaeological sites, buildings and structures, and cultural landscapes must be kept up to date to ensure that management decisions are informed by accurate and current information. As such, an inventory system must facilitate the seamless incorporation of new data and the ability to readily share information. Failure to properly manage heritage data can have serious consequences, such as delays protecting heritage places in the wake of natural disasters or armed conflicts, and it can create uncertainty about whether heritage resources would be impacted by proposed development.

CREATING ARCHES TO SUPPORT THE FIELD

In 2012, following consultations with several heritage organizations with experience in managing inventories and developing standards, including Historic England and the Flanders Heritage Agency, the GCI and WMF jointly invested in the development of Arches, a generic software platform to help address the challenges described above. Using the latest technologies and an open-source approach, version 1 of the Arches platform was released in 2013, freely available worldwide to independently deploy and customize as needed.

With the release of version 7 in 2022, Arches[1] has expanded far beyond the original requirements and now addresses data management demands in areas of the cultural heritage field as diverse as conservation science, publishing archival cultural materials, and heritage provenance. This expansion was made possible by the original Arches software design principles and priorities, which included:

- purpose built for the cultural heritage field;
- standards based (technical and heritage open standards), with ability to override standards if necessary;
- economical (freely available with no licensing fees or vendor lock-in);
- independently deployable;
- built with flexible, customizable, and publicly accessible software code;
- able to control access to data at any level (from fully restricted to openly shared);
- user friendly;
- committed to establishing a broad community for input and promoting collaboration.

One of the first important decisions in developing Arches was to make it open-source software (OSS). This facet offers numerous benefits. Unlike proprietary software, OSS code is freely available

1. https://www.archesproject.org/

and open for further improvement and customization, eliminating dependence on an individual vendor and the consequent risk of being locked into long-term licensing and maintenance costs. While the code is open, data in Arches is independently controlled and can be made open or private. The overriding ethos of an open-source environment is one that promotes community support, collaboration, and resource pooling. Additionally, the Arches open-source license stipulates that all improvements made to the code are to be freely shared with the broader community.

ARCHES CAPABILITIES

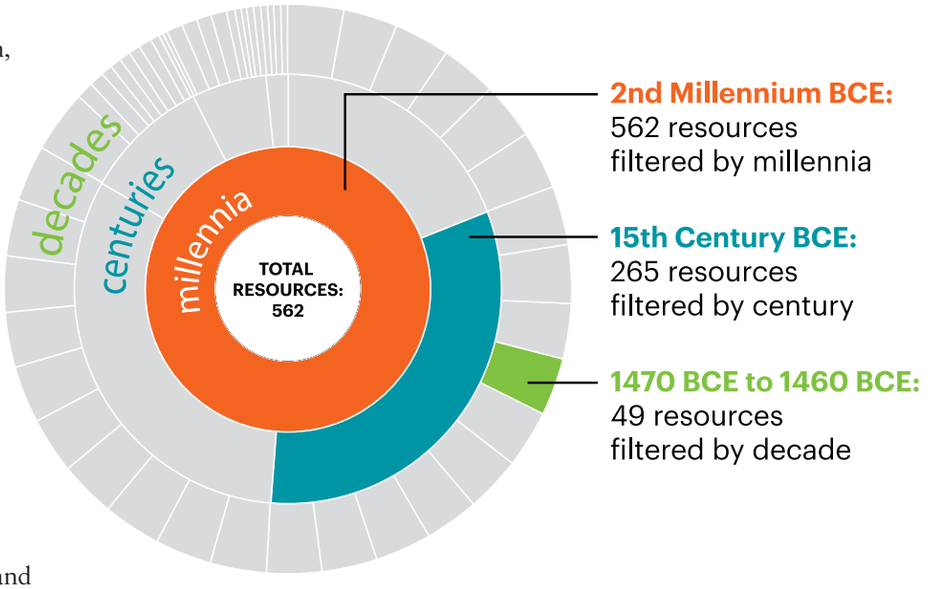
The capabilities of Arches fall into three broad categories: data management; data visualization and discovery; and workflows for task management.

Data management tools include the ability to create, edit, and share data, and to publish selected information online, while maintaining granular control over data access. Arches uses common nonproprietary file formats, and once data is structured within Arches it will outlive the software. Therefore, data entered or migrated into Arches today will be available to support a vast array of conservation goals far into the future.

There are a variety of tools that facilitate the *visualization and discovery* of data within Arches, including a map interface that can integrate historical maps and satellite imagery, allowing heritage resources to be discovered geographically. Relationships can be established and visualized on an interactive graph depicting an expanding web of relationships where previously unknown information can be discovered. For example, the graph can visualize relationships between a heritage site or object and historic events, conservation activities, scientific or other scholarly reports, and people and organizations associated with it. Linking this information to dates or other temporal attributes allows visual time-based searches using the so-called Timewheel. The ability to build these relationships and search by concept as well as by keyword is made possible by the underlying semantic data structure[2] and the use of localized controlled vocabularies.[3]

To help organizations automate their business processes, *task management workflows* can be customized to create data editing sessions that mirror those processes. For example, a workflow can be created to track the status and outcomes of heritage impact assessments. Another might record the process of taking a sample from a heritage object or place, describing its location, the purpose of the sample, and the instruments used to analyze it. Moreover, the process of sophisticated data structuring is automatically folded into the intuitive data-entry forms in a workflow, thereby shielding the user from the complexity that makes this possible.

Arches continues to expand and add capabilities. For example, internationalization, which allows all languages and scripts to be used, is now available in version 7. The first iteration of Arches for Science



The Timewheel is a circular histogram allowing users to filter data based on a time period—i.e., a millennium, century, or decade. The size of each time period segment represents the frequency that period appears in the data. Graphic: Getty Conservation Institute.

(AfS) has also been completed and is currently being tested. AfS is an expansion of the platform that will help conservation scientists and others to secure, retrieve, visualize, compare, and share scientific data and to track technical examination projects of heritage objects and, potentially, heritage places. It also includes the ability to annotate images of cultural materials under study, such as museum objects. Development has begun on building a new Reference Data Manager (RDM), which allows organizations more control to integrate, combine, and manage their local vocabularies and thesauri, helping ensure consistency of data entry and greatly improving search results.

ARCHES IN USE

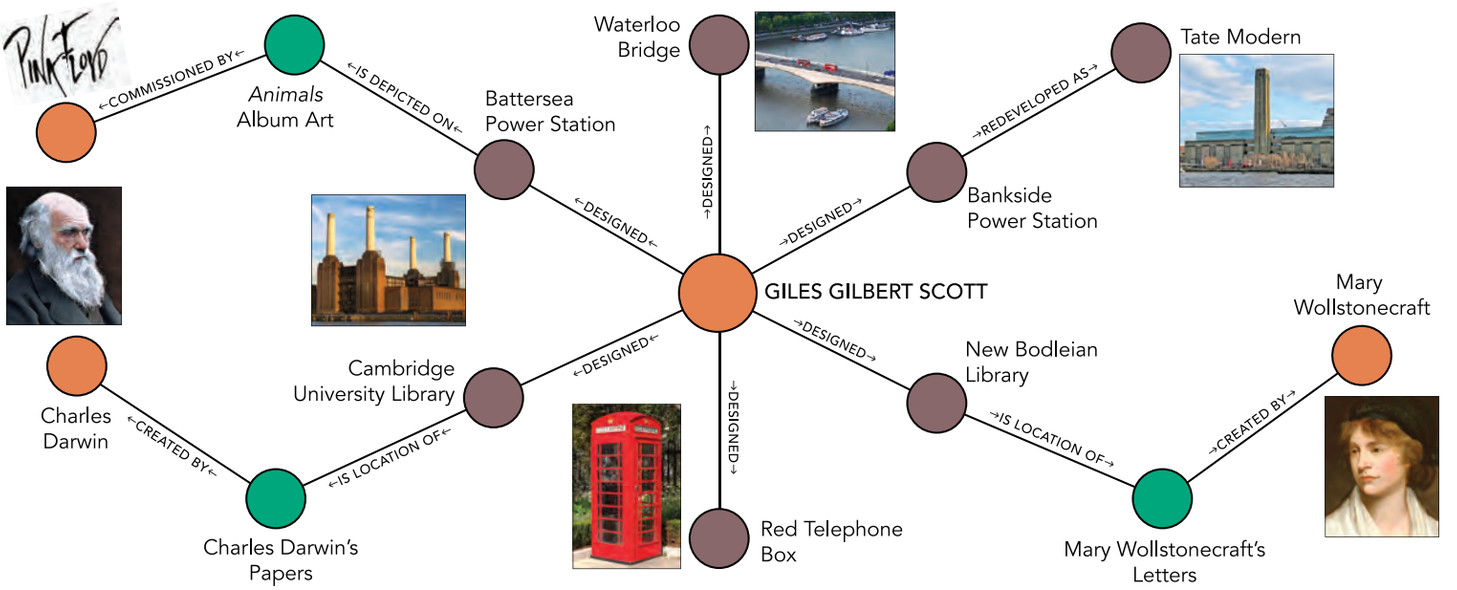
To date, the GCI knows of nearly one hundred implementations of Arches (already launched or in preparation), with many more in the planning stage; the open-source nature of Arches means there may be many more, including for uses beyond cultural heritage. The known implementations collectively record heritage spanning five continents and nearly sixty countries.

A few examples of Arches deployments convey the range of its uses in the field:[4]

- Jamaica, Barbados, Wales, Jersey, and the Isle of Man have deployed Arches for their national inventories of heritage places, and Canada is preparing to do the same. England is additionally preparing to implement Arches for its national maritime heritage inventory;
- on a regional scale, the Dunhuang Academy in China is deploying Arches to record and help monitor Buddhist grotto sites in Gansu Province, and the Florida Public Archaeology Network has implemented Arches as a tool for an ongoing citizen science program to monitor the condition of archaeological sites across the state;

2. Semantic data structuring organizes data in a logical way using an ontology, which is a specification that categorizes data elements and the relationships among them and ensures that data remain humanly readable regardless of the software platform (Arches uses the CIDOC Conceptual Reference Model).
3. The use of integrated controlled vocabularies (or thesauri) significantly improves the accuracy of data input and allows searching by broad concepts rather than by the exact term originally entered in a database.

4. For further information on these and other deployments of Arches, visit the "Who is using Arches?" webpage at: https://www.archesproject.org/implementations-of-arches/



In Arches, relationships between different data types can be established and visualized on an interactive graph. This example shows relationships between architect Giles Gilbert Scott and buildings and structures he designed, as well as further related archival materials, artworks, and other persons. Graphic: Getty Conservation Institute. Pink Floyd Logo: CMetalCore, Pink FloydSVG, 2016. Charles Darwin: © 2019 Julius Jääskeläinen. Battersea Power Station: © 2013 Tosh Marshall. Telephone box: 2012 Christoph Braun. Waterloo Bridge: © 2009 Tom Arthur. Tate Modern: © 2018 Acabashi. Mary Wollstonecraft: John Opie (1761–1807), *Mary Wollstonecraft*, c. 1797, oil on canvas. Artwork: © National Portrait Gallery, London.

- the cities of Los Angeles, Philadelphia, and Greater London and Lincoln in England have implemented Arches for their inventories of heritage places. San Francisco is also in the process of deploying Arches;
- the Arcadia Fund in London is supporting at least ten projects to record endangered heritage places in more than forty countries on three continents, each deploying Arches;
- the GCI is preparing to deploy Arches for Science to manage its conservation science data.

Other Arches deployments focus on heritage site management and on enabling online access to scholarly archival collections and historical maps, as well as 3D data of heritage places and collections.

THE ARCHES COMMUNITY

A defining goal of the Arches project has been to build a collaborative open-source community around the software. From its inception, the project has created infrastructures to attract new members, enable their collaboration, and amplify work of individual contributors. The Arches community has grown to include institutions and individuals representing the government sector, NGOs, philanthropy, academia, and commercial entities. Their involvement ranges from responding to questions from other community members on the forum and submitting bug fixes, to funding software enhancements, such as Arcadia's generous support for the development of internationalization. Through a partnership between the GCI, Historic England, and the City of Lincoln, a version of Arches has been customized to meet many of the requirements of the more than eighty UK Historic Environment Records, called Arches for HERs. This freely available, ready-made, and comprehensive inventory and consultations system will serve as a model of how purpose-built open-source software can provide exciting opportunities for entire heritage sectors. With the impending release of Arches for Science, the community will expand to include conservation scientists and others working with heritage-related scientific data. To date, community-driven Arches User Groups have been established in the United Kingdom and the United States, offering organizations and professionals further opportunities to collaborate and share resources.

WHAT'S NEXT?

The Arches project was established with the strategic aim of helping break the cycle of individual heritage organizations investing scarce resources in re-creating software. It has resulted in a freely available, state-of-the-art software platform requiring only marginal investments for customizations. Implementations around the world have demonstrated that collective investments in information infrastructures can allow heritage organizations to instead focus resources on documenting and protecting heritage and advancing their individual missions.

Even the most cutting-edge and well-engineered software will eventually become obsolete, but most importantly, data must outlive current software to be usable in as yet unknown future technologies. Just as technology advances, so should the structures that support it. As such, the long-term sustainability of Arches will be based not only on technology but also on people and institutions. The GCI is now advancing the Arches Governance Initiative to establish a framework for broader community participation in determining the future priorities and direction of Arches. This is a logical conclusion to a decade of work that has sought to more fully embed effective data management practices into the work of heritage organizations and professionals worldwide, helping the heritage field use the best tools available to protect and conserve our collective cultural legacy.

Alison Dalgity is a GCI senior project manager. David Myers is a GCI senior project specialist. Catherine Schmidt Patterson is a GCI scientist.

A DIGITAL REPOSITORY FOR THE PAST

The UK Archaeology Data Service

BY HOLLY WRIGHT

THE DATA FROM ARCHAEOLOGICAL INTERVENTIONS is unlike many other types of cultural heritage data. The most readily identifiable form of archaeological intervention—that of excavation—is unrepeatable. When we dig a site, much of the archaeological resource is destroyed, and careful recording produces the primary data about that resource. That record is increasingly "born digital," where there is no analog backup in the form of paper or permatrace, to which archaeologists can refer during post-excavation analysis and beyond.

This is unsurprising, as archaeology has always been an early adopter of any method or technology that can be applied to our research. For example, Computer Applications and Quantitative Methods in Archaeology, the primary international organization relating to digital applications in our field of research, will celebrate its fiftieth anniversary at its conference in Amsterdam in 2023.[1]

Digital data is exceptionally fragile, however. Consider the longevity of the digital tools in our own lives. How many of us use the same phones, laptops, and software we used five years ago? It's possible. But how many of us use the same devices we had *ten* years ago? Anyone? The pace at which digital technology moves, along with the lack of attention to stewardship that addresses the long-term sustainability and usability of archaeological data, is a threat to the discipline. We risk losing a generation of primary archaeological data if we fail to tackle these issues.

That said, archaeology has been working on solutions longer than most related disciplines. Indeed, archaeology is often looked to not only as an early adopter in digital preservation[2] and within the Open Access and Open Data movements, but as a discipline that employs new technology and methodologies and is knowledgeable about preserving and disseminating a wide range of data types. Archaeologists employ everything from the traditional geophysics, databases, and GIS, to scientific methods such as lipid analysis to determine what type of food was cooked in a pot; artificial intelligence to identify cut mark patterns on bones due to butchery; and measuring isotopes in skeletal material to investigate diet and movements of past peoples. If it is useful, we will use it.

Excavation related to the redevelopment of parts of Tottenham Court Road Underground Station in London's West End by Crossrail Ltd. The vast majority of UK archaeological work undertaken each year is development-led or commercial archaeology, and the ADS has prioritized making information about these projects broadly available. Photo: © Museum of London Archaeology CC-BY 4.0.

ESTABLISHMENT AND GROWTH OF ADS

I work for the Archaeology Data Service (ADS).[3] Founded in 1996, we are the world's longest-established, domain-specific, digital archive for archaeological data. While the ADS is embedded within the Department of Archaeology at the University of York in the United Kingdom, we have a national and international purview. Because we were established before Google or initiatives like Creative Commons, we have seen and experienced a great deal of change. The ADS is the leading accredited digital repository for heritage data generated by UK-based or UK-led fieldwork and research, and our core activity is long-term preservation of the data entrusted to us. To do this we follow a policy of active data management and curation to ensure the integrity, reliability, and accessibility of our data in perpetuity.

1. https://2023.caaconference.org/

2. Digital preservation should not be confused with digital recording. Digital preservation is correctly defined by the Digital Preservation Coalition as "the series of managed activities necessary to ensure continued access to digital materials for as long as necessary... (digital preservation) refers to all of the actions required to maintain access to digital materials beyond the limits of media failure or technological and organisational change." https://www.dpconline.org/digipres/what-is-digipres/

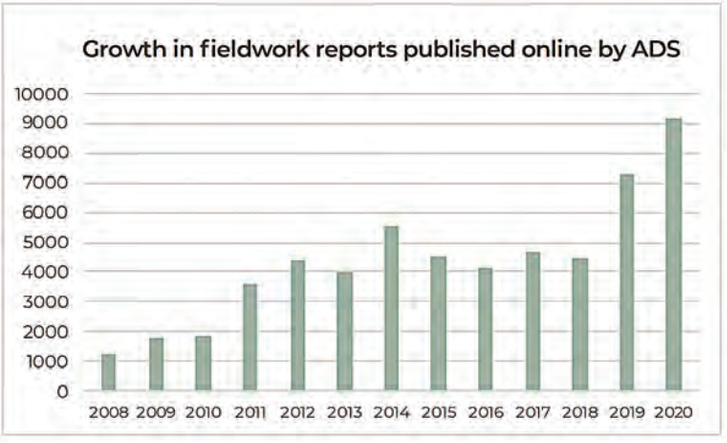
3. https://archaeologydataservice.ac.uk/

All resources archived with the ADS are Open Access, delivered through our website, to facilitate reuse by the heritage sector and wider community. The ADS is a leader in promoting good practice in the use of digital data in archaeology, providing technical advice to the research community through a range of collaborations. We participate in international research and partner with a wide range of archaeologists and digital practitioners worldwide.

Currently the ADS has sixteen full-time and two part-time staff, and an annual budget of around £1 million (1.2 million USD). The ADS began with an annual "core grant" from the Arts and Humanities Data Service, but from 2008 to 2020 the ADS received no external grant aid support and was self funded, with a more and more diverse funding model. Increasingly, some income comes from development-led, commercial archaeology, where we are a key partner in preserving and making resources freely available in ways that impact the day-to-day work and economic life cycles of UK commercial archaeology.[4] In 2020 the Arts and Humanities Research Council (AHRC), and more generally UK Research and Innovation (of which AHRC is a part), re-prioritized digital infrastructures, resulting in a return to some core funding for the ADS.

THE CORE ACTIVITY

The core activity of the ADS is the long-term digital preservation of the data entrusted to us. We serve every type of data-creator community in the United Kingdom—archaeological work generated through academic research, development-led/commercial work, and community projects. We accept an enormous range of digital data types, reflecting the diversity of digital methods used by archaeologists. Important examples include binary and plain text; CAD and vector graphics; databases and spreadsheets; images from photography, photogrammetry, satellite, and aerial capture; geophysics data; GIS files; stratigraphic matrices; 3D data from ground-based and aerial laser scanning; linked data formats; medical imaging; scientific data; and audio, video, and virtual reality files.



Graphic: Courtesy of the Archaeology Data Service.

Unlike a physical archive, digital preservation requires active curation—which is much more than ensuring data is "backed up." It includes planning and developing strategies and policies to sustain long-term access to digital materials, and liaising with data creators, data users, IT departments, and policy makers. Activities include managing digital materials, systems, and workflows to ensure their longevity; capturing all necessary associated contextual documentation; using appropriate standards to make digital materials robust and resilient; keeping up with the shifting technological landscape; providing appropriate access that adheres to security and sensitivity requirements; planning and strategizing to sustain access to digital research data for the long term; preserving continuity as well as functionality for future research; and ensuring data remains accessible and usable.[5]

The ADS, the second UK digital archive to be accredited with the Data Seal of Approval, was awarded the Digital Preservation Coalition's first Decennial Award in 2012 for the most outstanding contribution to digital preservation in the last decade, worldwide. We also develop and promote good practice in the creation and use of archaeological digital data through our Guides to Good Practice.[6]

The ADS remains committed to preserving all the types of digital data produced by archaeologists, even as that data grows in variety and size. A great challenge facing archaeology is preserving and disseminating results of development-led or commercial archaeology, which is the vast majority of UK archaeological work undertaken each year. The amount of fieldwork has far outpaced traditional modes of publication, and because of the decentralized nature of UK archaeology, it is difficult to construct a comprehensive record of the archaeological projects conducted.[7] In countries like the UK, development-led archaeology is prominent, producing a mountain of unpublished fieldwork reports, also known as "gray literature." In the past, the result was two hard copies of the report—one for the client and one for UK regional heritage inventories, known as Historic Environment Records (HERs). Commercial archaeologists typically undertake fieldwork and write reports under tight timelines, resulting in faster dissemination of new research than occurs in academia. The ADS has prioritized making this important resource more readily available; its "gray literature" library now comprises over sixty-five thousand unpublished reports, which, in advance of new building projects, are widely used by archaeological consultants and contractors as part of heritage impact assessments.

Information about current archaeological fieldwork is collected via the OASIS project,[8] a collaboration of the ADS with Historic England and Historic Environment Scotland. OASIS is an online system that allows archaeologists to upload key information about their fieldwork, according to national recording standards. Users must enter information about the report that allows the ADS to index the information and make it possible for others to find the reports they need, such as a project's location and who undertook the work, a summary of what was found, and what (if anything) is contained in the physical archive.

4. Julian D. Richards, "Twenty Years Preserving Data: A View from the United Kingdom," *Advances in Archaeological Practice* 5(3) (August 2017): 227–37. doi:10.1017/aap.2017.11

5. https://www.dpconline.org/digipres/dpeg-what-is-dp
6. https://guides.archaeologydataservice.ac.uk/g2gpwiki/
7. Tim N. L. Evans, "Holes in the Archaeological Record? A Comparison of National Event Databases for the Historic Environment in England," *The Historic Environment: Policy & Practice* 4 (2013): 19–34.
8. https://oasis.ac.uk/

An ADS digital archivist examining a range of obsolete digital media from the Newham Museum Archaeological Service, representing ten years of unpublished fieldwork. When the museum closed in 1998, its digital archive passed to the ADS. The archive comprised 220 floppy disks containing 6,432 files holding data from over 150 excavations. Photo: Courtesy of the Archaeology Data Service.

Uploading a project's results into OASIS is not just a way to preserve and disseminate the reports—in most counties and regions it is now required as part of national, regional, and local government authority planning processes. This then becomes part of the heritage impact assessments used to mitigate the destruction of historic environment assets, with the provision of publicly accessible archives and reports to inform future work and research. Once the entry has been signed off by the appropriate authority (either the archaeologists in the planning office or the national agency), the report can be sent to the ADS for archiving and subsequent Open Access dissemination via the ADS website. These unpublished fieldwork reports are freely available online, providing a foundational resource for UK archaeological research and heritage management. The number of reports deposited each month increases each year and currently runs around five hundred per month.

The ADS disseminates the contents of its own archives but also works with other data holders to provide a way to search across both our archives and others using a single search interface called ARCHSEARCH.[9] ARCHSEARCH is an online catalog indexing over 1.3 million records, including ADS collections and data held by UK HERs. Anyone preparing to undertake an archaeological intervention or desk-based assessment can use ARCHSEARCH to conduct a single query and locate much of the existing material about that site or region, all in one place. This is important for development-led, commercial work, where time saved by not having to query each HER individually is invaluable. In addition, any relevant community or university-led research held by the ADS that was not part of the planning process will be returned in the search alongside HER resources, building a much more complete picture of *all* archaeological research in that area.

INTERNATIONAL RESEARCH

ARCHSEARCH is currently undergoing a major upgrade, informed by another key activity of the ADS, international research—in particular the ARIADNE Infrastructure,[10] of which the ADS has been deputy coordinator throughout. ARIADNE was funded by the European Commission's 7th Framework Programme from 2014 to 2017, primarily to create a European infrastructure for archaeological data, the ARIADNE Portal.[11] The initiative included twenty-three partners in sixteen European countries.

The second four-year development phase of the project, called ARIADNEplus, is nearly complete. Funded from 2018 to 2022 through the European Commission's Horizon 2020 Programme, ARIADNEplus focused on expanding participation by archaeological data providers, with forty-one partners in twenty-three countries. The number of archaeological resources now accessible through the Portal will be well over three million when the current phase finishes at the end of 2022. The Art and Architecture Thesaurus (AAT), produced by the Getty Research Institute, has been invaluable throughout the Portal's development, as all subject terms used by the data holders have been mapped to the AAT in their national languages, but equally important has been PeriodO for archaeological time periods.[12] For example, if you search for "burial mound," what different languages and countries conceptually define as a "burial mound" will be returned in the search. Users can undertake sophisticated searches with time- and map-based search interfaces as well, or with them all in combination.

The resumption of AHRC funding has recently allowed the ADS to conduct user experience evaluations, resulting in a redesign of our website, to be rolled out by the end of 2022. Inspired by the work of ARIADNEplus, we will include a new version of ARCHSEARCH that will bring several fragmented services together, significantly improving the user experience and introducing efficiencies that will make the ADS more sustainable.

New research partnerships continue to be created, which will allow more Open Access data to be made available. One new initiative is under the auspices of the UK's Towards a National Collection program,[13] where we are playing a key role in the project Unpath'd Waters, focused on the UK's rich maritime heritage.[14] The ADS is also experiencing significant year-on-year increases from depositors, particularly to accommodate the digital legacy of the UK's transport infrastructure.

Our longevity has been hard won, but it has provided us with a diverse set of perspectives, partners, and collaborative opportunities, allowing us to lead where we can, and to learn from an amazing national and international ecosystem of archaeologists and heritage professionals.

Holly Wright is the International Projects Manager for the Archaeology Data Service.

9. https://archaeologydataservice.ac.uk/archsearch/basic.xhtml

10. ARIADNE Project http://legacy.ariadne-infrastructure.eu/
11. ARIADNE Portal https://portal.ariadne-infrastructure.eu/
12. https://perio.do/en/
13. https://www.nationalcollection.org.uk/
14. https://unpathdwaters.org.uk/

ETHICS, COMMUNITY, AND DATA

Members of the Wolastoqiyik standing along the water's edge at the village of Kingsclear in New Brunswick, celebrating Corpus Christi Day, ca. 1887. Canoes, traditional dress, and a priest are in view. Photo: George Taylor. Courtesy of the Provincial Archives of New Brunswick (Fonds Collection, P5-170).

BY RAMONA NICHOLAS AND NEHA GUPTA

IN NOVEMBER 2018 AN INTERNATIONAL WORKSHOP in Botswana on Indigenous data drafted the *CARE Principles for Indigenous Data Governance*—principles that seek to promote control by Indigenous communities over the wide range of data that originate in those communities. CARE (which stands for "collective benefit, authority to control, responsibility, and ethics") grew out of a pronounced need to advance Indigenous sovereignty over the collection, use, and management of its data, including cultural heritage data. Unsurprisingly, the power structures, institutions, legislation, and longtime practices that govern the documentation of heritage also shape the management of cultural heritage data. Despite some recognition in Canada of the rights of Indigenous peoples with respect to their data, a robust application of the CARE Principles in Canada has yet to be achieved, just as it has yet to be achieved in many other countries around the world.

EXTRACTIVE DATA MANAGEMENT

Many of us have encountered the phrase "data mining," which usually describes a process of digging through masses of raw and unorganized data to extract meaningful (and often commercially valuable) patterns. Unfortunately, this view of data as a resource suitable for "extraction" can be harmful to people and communities. Archaeologist Eldon Yellowhorn, a member of the Piikani Nation and a professor at Simon Fraser University, has observed that when non-Indigenous policy makers talk about "cultural resources," they are actually making Indigenous communities and heritage subject to Canadian provincial jurisdiction and law, superseding Aboriginal Title, which asserts First Nations, Métis, and Inuit rights to culture, data, and knowledge systems.[1] Too often data are made into yet another resource that can be extracted from communities that continue to fight for their sovereignty, land, livelihood, and way of life.

Digital and non-digital data describing the natural and cultural heritage important to many communities are typically kept in repositories, storerooms, archives, museums, and collections by a host of commercial, academic, and government institutions that have operated with little or no accountability to the communities whose heritage they keep. This is especially the case for many Indigenous communities worldwide, but it also affects other racialized[2] communities, including Black communities in the United States and many others displaced by economic and environmental disruptions or war.

International and national legal and institutional systems—typically dominated by Western, Eurocentric worldviews—rarely recognize these issues. Even countries, which have the most formal recognition under these legal systems, struggle with the repatriation and restitution of cultural heritage seized by colonial powers. Such struggles are even more difficult to navigate for Indigenous and descendant communities that have had limited formal recognition and rights to their heritage within these legal systems.

1. Aboriginal Title is an inherent Indigenous right. In 1763 the British Crown recognized Aboriginal Title, yet subsequent treaties defining its nature were interpreted by Crown representatives as extinguishing inherent rights. The 1982 Constitution Act transferring constitutional power to Canada recognizes First Nations, Métis, and Inuit as Indigenous peoples, reaffirming their existing rights to culture, data, and knowledge systems. See First Nations & Indigenous Studies, the University of British Columbia, *First Nations Studies Program*, "Aboriginal Title" (2009): https://indigenousfoundations.arts.ubc.ca/aboriginal_title/

2. The BIPOC Project (https://www.thebipocproject.org/) highlights "the unique relationship to whiteness that Indigenous and Black (African Americans) people have, which shapes the experiences of and relationship to white supremacy for all people of color within a U.S. context." *Racialized* in this context refers to the relationship to whiteness for people of color in a globalized world.

The 2007 United Nations Declaration on the Rights of Indigenous Peoples was a step toward remedying this situation and may pave the way toward reaffirming the rights of many historically excluded communities to their heritage. In looking at data, any framework for the management of cultural heritage data must emphasize human rights, especially the self-determination of Indigenous communities and Nations.

NOTHING ABOUT US WITHOUT US

Guided by the perspective that with data management human rights come first, we can define Indigenous data as "anything about an Indigenous community."[3] This definition is very broad in order to give it flexibility. Often distinctions, classifications, and categorizations that one group (e.g., archaeologists or museum curators) may make can be alien and inappropriate in another cultural context. For example, Indigenous communities may see interlinking and overlaps in some areas that outside groups separate, while these same communities may recognize key and socially meaningful distinctions in concepts that outsiders ignore. For archaeologists, "archaeological data" means tangible objects and documentation of immovable artifacts recovered during excavations, which upon recovery are often distributed for further study among specialists. Yet for Indigenous communities, these are the belongings of their ancestors and represent their labor and creativity. They thus reject practices that remove these belongings and break their connection with the land and community.

Typically, databases and software privilege one community's set of values, assumptions, and ways of organizing reality. As a result, these databases can be rigid, unable to accommodate anything outside their models, and are often developed as isolated silos by individuals lacking broader perspectives.[4] Siloed data go hand in hand with siloed decision-making unconcerned with Indigenous community interests and collective ownership.

To forestall sidelining Indigenous communities as *subjects of* data, the phrase "Nothing about us without us" captures the idea that data instead should be *subject to* Indigenous community interests and priorities. By asserting an expansive scope for what constitutes Indigenous data—and by acknowledging the value of Indigenous perspectives in the creation, use, and management of data—we confront the problems inherent in databases designed and used in siloed isolation, distanced from Indigenous interests and culture. In fact, Indigenous knowledge and science can complement one another, acting as "two-eyed seeing," informing how we build and use information systems so that they accommodate more needs and perspectives.

The necessity of genuine trust and respect for Indigenous points of view in developing cultural heritage information is illustrated by the case of a famous research archaeologist who approached an Indigenous community in Canada seeking information about burials. The archaeologist, although well recognized in academic circles, made no effort to build trust with the community, and community members—suspicious of his motivations and worried that he might be, in effect, a grave robber—hid information about burial locations and thus protected an important part of their heritage from violation and outside appropriation. This example demonstrates how data will be incomplete if developed outside of a foundation of trust and reciprocity. Unfortunately, power dynamics and continuing colonialistic structures work against trust and reciprocity. For this reason, there is a strong need for Indigenous representation within the cultural resource management, government, academic, and museum sectors. Without Indigenous leadership in these professions, Indigenous perspectives and interests will remain sidelined and diminished.

RESEARCHED TO DEATH

For many Indigenous scholars and communities, the term "research" is a dirty word,[5] as it is associated with betrayals of trust and violations of human rights during the process of data collection, use, and management. It is not that Indigenous peoples are against research or are "anti-science." On the contrary, it means that Indigenous communities expect to have their voices heard and interests valued, and to receive

A display at an exhibit at the Fredericton Region Museum, New Brunswick. The photo in the display shows curator Ramona Nicholas and her mother conducting a ceremony at the Wolastoq River. The display case also includes ceremonial items such as plant medicine (red bag, center), ceramic bowls and a woven basket, and an eagle feather for cleansing. Photo: Ramona Nicholas.

3. First Nations Information Governance Centre, *Ownership, Control, Access, and Possession (OCAP™): The Path to First Nations Information Governance* (Ottawa: The First Nations Information Governance Centre, 2014): https://fnigc.ca/ocap; Tahu Kukutai and John Taylor, "Data Sovereignty for Indigenous Peoples: Current Practice and Future Needs," in *Indigenous Data Sovereignty: Toward an Agenda*, edited by Tahu Kukutai and John Taylor (Canberra: Australian National University Press, 2016), 1–14; S. R. Carroll, I. Garba, O. L. Figueroa-Rodríguez, J. Holbrook, R. Lovett, S. Materechera, M. Parsons, K. Raseroka, D. Rodriguez-Lonebear, R. Rowe, R. Sara, J. D. Walker, J. Anderson, and M. Hudson, "The CARE Principles for Indigenous Data Governance," *Data Science Journal* 19, no. 1 (2020): 43. DOI: http://doi.org/10.5334/dsj-2020-043

4. Martin Nakata and Marcia Langton, eds., *Australian Indigenous Knowledge and Libraries* (Canberra: Australian Academic and Research Libraries, 2005).

5. Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples* (London: Zed Books, 1999).

reasonable benefit from research activities that involve them. In many instances, non-Indigenous researchers have taken information, biological samples, and tangible materials from communities with promises to present the research results to those communities. Too often these researchers have used data for purposes other than what the community consented to or have provided only limited results, making little effort to share research in a way benefiting the community that participated in the study. Changing such practices should not be an Indigenous community's burden. Rather, institutions seeking to conduct research must change their mindset and engage in real partnerships with Indigenous communities—partnerships in which those communities accrue real benefit and control over the resulting research data.

In a recent report commissioned by Africa No Filter, Molemo Moiloa[6] demonstrates that even urgent discussions regarding restitution of African heritage continue to concentrate on European and American voices over African ones, thus silencing African perspectives and interests in "continued violence of African subjectivity." Clearly, the participation of Indigenous peoples in all aspects of the research process is key to ethical work. Some Indigenous Nations and communities now have their own research review processes to govern what kinds of activities are proposed, what data will be collected, who will own it, and what uses are allowed; they also consider potential harms associated with the research, the research benefits, and the accountability of the researchers to the community. When Indigenous communities are true collaborators, their perspectives inform and guide the research.

Launch of the *Traveling the Wabanaki Way* digital exhibition in June 2022 in Fredericton, New Brunswick. Ramona Nicholas is explaining the key themes in the exhibit. The panel in the background, in Wolastoqey, is part of the onsite exhibition and describes a ceremony related to the Wabanaki responsibility as caretakers of the earth. Photo: Neha Gupta.

REFORMING DATA MANAGEMENT

There are good examples of First Nations collecting, using, and managing their own data, particularly health information. Many Nations have dedicated archaeology offices that oversee collection of archaeological data in their areas of responsibility and use these data in making decisions about their lands. These data stay within the Nation for its internal use, and some communities have made significant investments in technologies to manage their data. The Stó:lō Nation's Research and Resource Management Centre has developed Stó:lōConnect[7] as a part of the Nation's engagement and consultation processes.

Often Indigenous communities must navigate multiple databases and software to access information about themselves, and there are gaps in their resources and capacity to make those data available and useful. Non-Indigenous holding institutions should put more effort into understanding how cultural heritage data can serve Indigenous interests. Data cannot be considered in isolation from larger issues of power and accountability in the practice of cultural heritage research and conservation. Data management is a social practice and can reflect the "structural inequalities" (to use social science jargon) that exist in society. The management of cultural heritage data should be considered as part of the conversation about how to dismantle imbalances in wealth and power. This is a must for cultural heritage professionals working with Indigenous communities and other communities that face similar challenges. An example of how community interests were put first can be found in a heritage project in which the Metepenagiag Mi'kmaq Nation in New Brunswick, under the leadership of a community elder, created a heritage park that showcased the community's history. It was this community member who located an ancient burial mound, and it was the community itself that decided how much work should take place at the mound and what should happen with materials that were recovered. Because community members led the project, there was a stronger connection with—and control of—the data.

The principle of "Nothing about us without us" means much more than simply seeking one-time approval from Indigenous representatives for some data collection project. It emphasizes ongoing recognition and relationship building. Such relationships are living—they need nurturing, feeding, and ongoing care. Indeed, one cannot really implement the CARE Principles without caring about the underlying relationships that go into building community.

We are hopeful that collectively we are developing better capacity and tools to align data with positive relationship building. An example of these efforts is the Local Contexts project,[8] whose mission is "to enhance and legitimize locally based decision-making and Indigenous governance frameworks for determining ownership, access, and culturally appropriate conditions for sharing historical, contemporary, and future collections of cultural heritage and Indigenous data." Their efforts, along with others, can help associate digital data with living communities, acknowledging that data have a connection and significance to a community. That continual association of data and communities may encourage the kinds of ongoing and sustained relationships required.

Ramona Nicholas, an archaeologist based in New Brunswick, is a member of the Wolastoqey Nation; she recently curated Traveling the Wabanaki Way, *an in-person and digital exhibition that shares the heritage of the Wabanaki people from the territory encompassed by current-day New Brunswick (https://travelingthewabanakiway.com/). Neha Gupta is an archaeologist and an assistant professor at the University of British Columbia.*

6. Molemo Moiloa, "Reclaiming Restitution: Centering and Contextualizing the African Narrative," report commissioned by Africa No Filter (Open Society Foundations, 2022): https://openrestitution.africa/reclaiming-restitution-centering-the-african-narrative/

7. Dave Schaepe and Matt McGinity, *Stó:lōConnect: A Digital System Supporting Stó:lō Heritage, Land, Environmental Stewardship*, presentation for Working Tools Seminar Series: Community-Facing Data Management Platforms for Indigenous-University Partnerships, University of British Columbia, October 23, 2020: https://youtu.be/HYQi4B6vLSA

8. https://localcontexts.org/about/about-local-contexts/

WHEN KNOWLEDGE BECOMES DATA

A Conversation about Heritage Data Management

MAHMOUD ABDELRAZEK, trained in geology, computational archaeology, and database management, is a senior research data consultant doing advanced research computing at University College London (UCL).

JOE PADFIELD is a principal scientist at the National Gallery in London, where he is responsible for several of the National Gallery's collaborative national and international external research projects.

MARIO SANTANA-QUINTERO is a professor at Carleton University in Ottawa, Canada, and a Carleton Immersive Media Studio Lab faculty member, whose research focuses on digital workflows for the conservation of historic places and an ethical framework for the digital recording of historic places. He also serves as secretary general of the International Council on Monuments and Sites.

They spoke with **CATHERINE PATTERSON**, a GCI scientist, and **JEFFREY LEVIN**, editor of *Conservation Perspectives, The GCI Newsletter*.

CATHERINE PATTERSON What role does digital data play in the heritage field—and more specifically, what do you see as the relationship between digital data and heritage preservation itself?

JOE PADFIELD It depends on your definition of data. The broadest definition of data relates to information—and information is key to the heritage field. However, if we lose the context of gathered information, the why we do things and the what we did, then we can end up repeating or undoing what was done before because we don't understand why it was done in the first place. It's key for conservators to be able to capture what we did, the processes we used, and the materials we used, but the why can also be very important. When knowledge is captured as data, the efficiency of how one gathers and collects information in such a form that it can be sustained and accessible in the future becomes an issue. It can be very important for the field to know the where and how this transference between knowledge and data happens.

MARIO SANTANA-QUINTERO You really put it right. It depends on how you look at it. For example, we were working in the United Arab Emirates where park rangers use WhatsApp to report on the cultural landscape. That's digital data, right? And then, of course, we digitally record sites for their conservation. In communications, digital is increasingly used—we use Zoom to communicate, to meet, and to teach. If we talk about recording data to make decisions, digital tools are used a lot. With dissemination, the digital video recordings we make of sites can bring access to sites through the Web. With the pandemic, many museums have used digital technology to provide access. What happens to those digital assets is another question—are they meant to be there for a short time, or are they to be stored and utilized in the future? I honestly don't think any of *my* digital assets will survive me.

MAHMOUD ABDELRAZEK I'd classify the role data plays. Let's say we have a monument we want to conserve. We have knowledge today to do 3D capture of a site's physical characteristics that can enable people to experience it without having to visit it. The other sort of thing is what I'd call modeling—not as in a 3D representation but rather in capturing the essence of a site and distilling it into certain attributes. Eventually this data funnels into a study. In an ideal world there would be one unified format for the 3D modeling of a site and one unified system for collecting information about a particular site. This is how I see the digital realm helping conservation. Once you collect information about a site and recognize its importance, perhaps this will support efforts to conserve its physical life. Making knowledge about a site accessible to people may lead to action that preserves the site. We can use digital systems to do this in an efficient way.

JEFFREY LEVIN There are many inputs into cultural heritage data about a particular place—its current condition, its materiality, its historical context—and you want to capture that information in a holistic way. Is one of the challenges with heritage data that there's a tendency to look at one part of the elephant, so to speak, as opposed to seeing the entire elephant?

ABDELRAZEK One of the definitions of modeling is that it's a portion of the reality. The *reality* of something is not exactly the same as the *perception* of the same thing. Information about

a site is always affected by the knowledge and perception of the people recording the information. It's not just the recording of a particular attribute—it's more the choice of the attribute itself. If you didn't know that a particular attribute was important, you wouldn't necessarily record it. If you look at the historical archaeological studies done in Persia or Mesopotamia or Egypt, you'll see that people used techniques and recording systems very different from those we have nowadays, because their understanding of what should be recorded was different. Hopefully, in the future, we'll have a better understanding of the same site, and we'll record different things about it.

PADFIELD The problem with heritage data in general is one of imagination and managing expectations. Whether it's a broken pot or it's the *Mona Lisa*, these works are unique, and any examination of them is done at a certain point in time. Even something on a gallery wall is slowly degrading over time. As for recording an archaeological excavation, once you've dug it up, you can't really do it again. You use the most efficient available technique you can to capture all of the information you can, but the reality is that you only have so many resources, so much time, and so many specialists who know how to use the equipment. There's this expectation that digital is easy—you push a button, and it happens—but digital data requires as much work and specialists' knowledge as anything else. Heritage calls out for the best available approach, but practitioners, perhaps sitting in a small studio, are thinking, "How can I possibly compete with something that's been done on the pyramids or at the Louvre?"—and then they just do what they've done before. Managing expectations in the digital age is tricky. We see what can be done, and people want to engage in best practice, but then reality kicks in.

SANTANA-QUINTERO We're always seeking funding to get the best equipment we can. But what we're capable of doing is one thing and what the conservators are capable of doing with the data we provide is another. For example, when we did a project for the GCI, we produced about four terabytes of data. When I brought it to the Institute, I was told that four terabytes is the entire server size. We collected huge amounts of information, but how are we going to store it—and if we continue, how are we going to preserve more? Another thing is the incredible advance in technology. There's a new device I'm interested in purchasing, but it's not simply expensive—in addition, the data processing is done in the cloud, which you pay for yearly. There's this big move to cloud processing, and I don't know how conservation institutions will deal with continuously paying for data processing.

PATTERSON You've all brought up challenges in data management—expertise, the perceptions of data collectors, how to define and unify data, managing expectations, the vast advances in technology, and the costs associated with maintaining data. Are there other challenges in this area?

PADFIELD I'd add the variables in communication. Heritage science in general covers a huge range of domains. When you're translating anything complicated from one domain to another, there are communication problems. The difficulty with digital data is the expectation that it should be translated to and for everybody, and that it be immediate and automatic. If you're looking at using new equipment, you need to work out how to interpret the data for the specialists on the topic, and then interpret it for anybody else *and* the public. How you transfer understanding of the data is a key issue.

SANTANA-QUINTERO Another challenge is responsibility for the data. When it comes to heritage, digital data gives you some kind of power and credibility—and that credibility is very important for many organizations. How can we use those digital assets? Should I be entitled to use the data I collect to promote myself? Is the data I collect ultimately benefiting the local community that lives near that site?

ABDELRAZEK A main challenge is funding. From the standpoint of a UK university or research institution, funding is available for physical sciences way more than for social sciences, including heritage conservation. Another challenge is the skills people develop working for these projects. My colleagues have few career development opportunities, which limits from the start the number of people going into the field. The skills needed for researchers doing this work go beyond knowing about heritage—it also requires knowing technology in order to use it to capture information. Sometimes the technology is so complicated you need a degree to learn it. Conservation projects can last five or ten years, and these researchers must move on. Eventually when you begin a new conservation project, you need to start from scratch to find someone who's got the skills. That's difficult. A solution achieved at UCL is that the university keeps a separate department with people who have the technical skills required for projects, and they can come in to help, saving a project time and money. One thing they also do—and other universities have moved toward this—is to have their own "cloud," which is good, too. But when you're dealing with a device like Mario mentioned, it's a whole package—the hardware, the software, and the computers that run it. I don't think a lot of universities are able to do that. In the heritage domain, there often isn't software that researchers know will be sustained well into the future.

PATTERSON Do each of you see professionals having to choose between dealing with the digital data and doing their conservation work because of these challenges? And if so, what are the consequences of that?

PADFIELD I think there's a difference between a cultural heritage institution and a university. A university is set up to do research and teaching, whereas a cultural heritage institution has the more blurred purpose of serving the public and looking

Photo: Courtesy of Mahmoud Abdelrazek.

A data management plan is something I care about a lot. I've seen a lot of projects where the data management plan has been ... a box to be ticked. In reality, it's a living thing. In many cases, it's the one thing that keeps the project on track, beginning with an understanding of exactly what data you're collecting and what you're using it for.

MAHMOUD ABDELRAZEK

after a collection, then carrying out research as well. Personally, I've been using open-source solutions to do things in a research environment. But they're often not directly connected with the production environment where our digital teams engage with the public or produce websites. Because of limited time and resources there can be a less agile—but realistic or practical—focus on certain systems within institutions. You might hear, "Yes, we'd like to make use of more sustainable open-source systems, but unfortunately our current skill set and experience can't ensure reliable maintenance and support." So, you potentially come up against that problem of being able to imagine how things might change. One might see what could be done if they could just steer the oil tanker slightly to the left and wait five years, but in five years the technology has shifted and you're having the same conversation again. The speed of development of digital technologies is both a plus and a negative because you have to bring everybody with you. That's from a managerial point of view, but also from a skill set standpoint if you're talking about conservation. Bringing that skill set along with each step of digital development is difficult.

SANTANA-QUINTERO It's very important to say that most of the digital tools we use are primarily focused on a site's visual aspects. But many of our colleagues claim we're digitally preserving sites. I'm always against saying that. Digital data only produces a record of one of the dimensions of a heritage site. We're not preserving the site through digital collection. We have to be firm in saying that the main purpose is to maintain the sites rather than digitally preserve them.

PADFIELD I principally work with paintings at the National Gallery, where there's a bias towards the physical object. But I've heard it said that things have been conserved because they've been digitized. People discuss creating a 3D digital surrogate—if you had the equipment—where you know everything down to the individual subatomic particles and could make a 3D re-creation. But the amount of work, technology, and data required to come anywhere near that would dwarf anything we're doing now. But that's what people believe has almost happened. Some people are using scanning XRD to look at the pigment structure within the surface of paintings, but it's incredibly slow and can take weeks to do one small painting. If you're looking at an archaeological site, it's just not possible. We do the examination to understand the materiality in order to help preserve it. In the process of doing an archaeological dig, you're changing the physical nature of the site, and in that sense you're not sustaining the site as it was. You're sustaining information. So that's a gray area, whereas if you've got physical objects in a museum, it's more black and white.

ABDELRAZEK In the south of Egypt there's a temple called Dendera, whose ceiling and the walls for ages and ages were covered with soot. Recently they removed the soot, and it turns out the original colorful paintings were there, with blue, yellow, red, and green. Imagine if this was 3D scanned while the soot was still there. The details and the experience of going through this site cannot be mapped. There are so many sites in Egypt where you have the experience of walking into a space with massive structures that represent how massive the king was who built it. These things cannot be digitized.

LEVIN How much have we already lost in terms of heritage digital data? It's not as if we need to keep everything, but is certain critical information already gone?

PADFIELD You have to put the loss of digital data next to the loss of physical data. Many objects have been lost, many sites have been lost, and many records have been lost. For years with technical examination of works of art, the raw data was only understandable by the person who stood over the machine as it was working. Interoperability was nonexistent. You might have a printout of graph paper, but the digital data itself might never have been

useful to anybody else. A lot of digital data that wasn't perceived to be needed at the time has been lost. At many institutions you have boxes of floppy disks and Zip drives and those kinds of things. If you manage digital data well, it will last forever—but *how* you manage digital data well is incredibly complicated.

SANTANA-QUINTERO There is no funding for the digital preservation of files. Because of the pandemic I wasn't traveling much and had some time, so I decided to use the Dataverse system the university had developed, for the digital assets that my students created over the last ten years. I selected very general formats, and I've been gradually doing this. In Canada the universities are providing these kinds of services because people want to store their research files. But there's no ethical commitment to do it, and there's no funding, which is a major problem. It takes time to store, catalog, and correctly describe the provenance of the data set. These things are not included in the project briefs we get in many funding proposals or the projects we do as consultants.

PADFIELD We've been having discussions in the National Gallery about digital asset management systems, and I keep saying, "Can we talk about digital repositories as well?" The response is, "We need to deal with this first." For the sustainability of our data, proper data repositories are key, but people don't think enough about them because it's less standard technology. When you stick stuff in a repository, what files, metadata, and paradata do you put in it? It changes all the time. And that's where the difficulty is, because even if you factor in the costs in the original proposal submitted five years before you started the work, the required paradata, metadata, and formats have changed. You almost need to rubber-stamp an increase of 30 percent of the required funding. I'd like a data repository system that allows you to define your data method with a file you upload with your data rather than the database structure underneath, because that would allow many domains to use the same infrastructure. Currently you need a dedicated system for your field, which is a missed point really. In this field, many domains need to embrace data repositories, and a lot more user requirement information should go in them.

LEVIN Are there certain things that are foundational with respect to what constitutes best practice in the creation of cultural heritage data, how the data ends up in the repositories, and how it gets managed in repositories?

ABDELRAZEK When you start on a project, you've got to have a management plan. Included in the plan should be consideration for FAIR[1] data—Findable, Accessible, Interoperable, and Reusable. The mistake people make is that they assume that data should be findable, accessible, interoperable, and reusable *by humans*. It should be findable and so forth by a machine too, meaning that the information should be in the same logical system that another machine can read. One way that digital data is lost is through the loss of the physical storage the data is stored on. Even if you have the actual storage, you might not have the software that can read the data. This is the case with a lot of banking systems—they try to sustain old database systems because they can't risk moving to a new system with information possibly being lost in the migration. In heritage, we have the opportunity to define certain schema. Some institutions have their own data repository and enforce certain metadata schema to go with it. The most famous of them is DataCite, an organization that issues digital object identifiers, and they have a schema. Obviously, the schema is not specific to a particular media type, but this is the trade-off that you have to have between describing an object with all its attributes or being general. If you want something standardized, you must be somewhere in between. A good solution is to start with a data management plan, include those attributes in it, and plan at the end of a project for the data to go into some sort of repository, including metadata that goes with it in a format that can be found and used by a machine.

SANTANA-QUINTERO Historic England has very good standards that we often use in collecting data. Heritage professionals in informational technologies should be aware of those standards and abide by them. But this is not often the case. Second, you have to lay out the options. We make an analysis of the situation, offer our prognosis, and say, "You should utilize this type of technology, you're going to get these files, and this will be adapted to your institutional needs." We can produce the best example of a 3D model, but if people cannot see it or manipulate it, why are we making it? The "why" drives the "how."

PADFIELD The notion of the FAIR principles is extremely important. And I think it's good to extend the notion of FAIR to how you did it, what tools you used, and who was involved. Often in cultural heritage, your interpretation comes down to a very small piece of information relative to another small piece of information, which can shift because of the process used to do it. How you processed the data you gathered is directly related to the question you were trying to answer. But that's not necessarily the question someone wants to answer ten years later. So FAIR could be a lot broader than it was originally envisioned. The other thing with regard to data management plans is that having a Post-it Note saying "I will save my data on a floppy disk in my top drawer" is a data management plan. It's not a very good one, but it is a plan. For most of the people dealing with data, data isn't their research project. Their project is something else entirely. The ideal is that good management of your data should be as easy as opening a Word document. Research scientists who are trying to capture data know it's important, but it comes back to a resource problem. That's not their job. Their job is to do the research. It's not unique,

1. The FAIR principles have been identified as key aspects of good data management practice.

Photo: Courtesy of Joe Padfield.

It's key for conservators to be able to capture what we did, the processes we used, and the materials we used, but the why can also be very important. When knowledge is captured as data, the efficiency of how one gathers and collects information in such a form that it can be sustained and accessible in the future becomes an issue.

JOE PADFIELD

but cultural heritage suffers from the many hats problem. People are expected to do many different things, and digital data is one of them. We need work examples that are clear and reproducible and have the stamp of approval. Having a use case that I can replicate, that's sustained, and that's backed up is quite important.

PATTERSON It occurs to me that there's a natural connection between this conversation about the elements of good practice and baseline ethical concerns. Are there things that each individual researcher should be responsible for—or not? What should our baseline idea of ethics around data management be?

SANTANA-QUINTERO In terms of data itself, we have intellectual property agreements. When I work with the GCI, we share the copyright on the digital assets produced and the right to publish. And the GCI has an agreement with the partner they're working with. So we cannot disseminate the data unless we've gone through this checklist. It's so easy to post something on a social media platform or website that could have a negative effect on the community and the cultural heritage that we're preserving. Of course, I have some colleagues who say that when we collect the data, we transform it into a product, so where is the copyright there? It's complex.

PADFIELD I'd say that potentially IP is the wrong way to look at it. We're forced to because it's money and that's the root of it. But attribution is probably a more helpful way of looking at it. It's ensuring that there is proper attribution of all the people involved at a cultural site, rather than saying, "I own this bit and you own that bit." You do need to consider their needs and the limitations required, because, as you said, certain things shouldn't be stuck on social media. Ethical handling should be a chapter in the data management plan because it's different in every case.

Now people generally do data management plans because funders are increasingly requiring it. I'd say we're getting there. But the plans need to be tools rather than boxes to be ticked. They need to be structured so it easy for people to do documentation, rather than being seen as an extra job they must do at project's end to make their funder happy. And there still needs to be some kind of infrastructure in place to sustain the data—whether that's as part of national infrastructure processes or it's an international organization—because it's unrealistic to expect funders are always going to cover it. Perhaps a global organization could look after data. But someone needs to pay for it, and it would be a large budget.

ABDELRAZEK A data management plan is something I care about a lot. I've seen a lot of projects where the data management plan has been exactly as Joe said—a box to be ticked. In reality, it's a living thing. In many cases, it's the one thing that keeps the project on track, beginning with an understanding of exactly what data you're collecting and what you're using it for. In many cases, the data management plan isn't reviewed by anyone. Sometimes funders review it and sometimes nobody reviews it for the main reason that the technical knowledge required to evaluate it does not exist in the department that's doing it. The fact that nobody looks at it is quite concerning. One aspect of this is that if researchers don't have an ethical review of the data they collect, sometimes that data violates some principle of the culture that the data is being collected about. There are many situations where a certain culture would prohibit access to such information, and you end up with researchers violating this. A conversation obviously can be had about who owns a place and the information about the place, as well as the rights to data collected by someone other than the people who live in a particular place or who created a piece of art.

PATTERSON I think that could extend to the intangible information that's embedded in all types of data, whether it's a 3D scan of a place or information that's embedded in a spectroscopic trace that I may collect in a scientific lab.

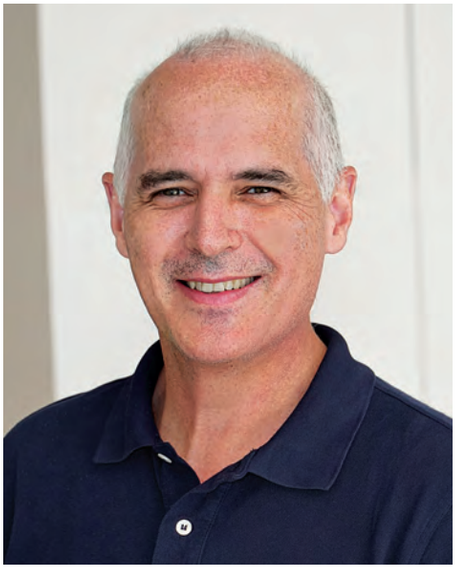


Photo: Anna Flavin, GCI.

When it comes to heritage, digital data gives you some kind of power and credibility—and that credibility is very important for many organizations. How can we use those digital assets? Should I be entitled to use the data I collect to promote myself? Is the data I collect ultimately benefiting the local community that lives near that site?

MARIO SANTANA-QUINTERO

LEVIN Yes—and who ultimately owns data created by a project fifty years from now, assuming it does get sustained?

PADFIELD The institutions involved might not exist in fifty years. If data cannot be released under an open license at the point of capture, then an embargo period should be defined, after which it will automatically be released under an open license. If you don't have that agreement at the start, you end up with data that effectively gets thrown away because there's no legal way to make use of it. I know people who've been capturing cultural heritage images for years, and they've got a wonderful catalog of images they can't release because there's no practical way of tracking down the rights for each. They cannot commercially take the risk of releasing them. You can have data embargoed for good reasons, but the end point should always be the open release of the data.

SANTANA-QUINTERO If you look at the World Heritage Convention, countries are responsible for the assets that they have on the World Heritage List. Now the World Heritage Convention is a government document, and the data information we're allowed to record and to disseminate about a site can always be vetoed by the state. It might be a little unfair to say that as cultural heritage experts we should come up with the framework for the data. It's actually for the governments to come up with the framework. As for the sustainability of digital assets, if we look at the documents that Robin Letellier put together in 2007, he said that data should be preserved by the institution caring for the site. But he also says that the heritage recording specialist should have a copy and commit to preserving it. We have those principles, but how we implement them is another question.

ABDELRAZEK Sustainability of the data has a lot to do with the way it's collected and stored. As to ownership and rights to the data, I'm going to speak from personal experience. Being Egyptian and having dealt with a lot of African researchers, I know that some researchers from non-African universities would come in, collect data, and publish papers without mentioning the names of or acknowledging local collaborators. Unless the lead researcher lives in the place where the study took place, the local Africans feel they've been robbed, because most of the data collection has been done by them. In many cases they feel this is something they owned or that they helped create, and they don't get the rights because the system doesn't necessarily enforce this kind of ownership. Some of the local researchers consider this a new form of colonization. Instead of the physical resources, you now have knowledge. There should be some sanction on universities or researchers who engage in this behavior, so we have some enforcement. A lot of researchers from African countries lack access to international platforms, and the result is that the rights to a lot of these data resources can be lost. I agree that data should be released to the public after a specific period of time, but this isn't something that many national institutes or museums in many countries will agree to. There's a need to build trust with people who have authority over a site itself—and giving them access to the information *they* own is a way to regain their trust.

LEVIN The principle you're articulating is one that goes back to conservation itself—the principle of partnering with national authorities in other countries in conserving their cultural heritage. Trust must be established for such conservation to succeed. And what this conversation as a whole has made clear is that for conservation more generally to succeed, the data the field produces in the course of its work must be thoughtfully managed in a way that sustains it, shares it, and makes it accessible well into the future.

RESOURCES
HERITAGE DATA MANAGEMENT

POLICY DOCUMENTS, STANDARDS & GUIDELINES

"The CARE Principles for Indigenous Data Governance" by Stephanie Russo Carroll et al., in *Data Science Journal* 19, no. 1 (2020), 43ff. http://doi.org/10.5334/dsj-2020-043

"The FAIR Guiding Principles for Scientific Data Management and Stewardship" by Mark D. Wilkinson et al., in *Scientific Data* 3, article no. 160018 (2016). https://doi.org/10.1038/sdata.2016.18

Guides to Good Practice by Archaeology Data Service/Digital Antiquity. https://guides.archaeologydataservice.ac.uk/g2gpwiki/

"The Heritage Data Reuse Charter: From Principles to Research Workflows" by Erzsébet Tóth-Czifra and Laurent Romary, ffhalshs-02475692f (2020). https://halshs.archives-ouvertes.fr/halshs-02475692

OECD Principles and Guidelines for Access to Research Data from Public Funding. https://www.oecd.org/sti/inno/38500813.pdf

Open Data Charter. Opendatacharter.net

UNESCO Charter on the Preservation of the Digital Heritage. https://unesdoc.unesco.org/ark:/48223/pf0000179529.page=2

UNESCO Recommendation Concerning the Preservation of, and Access to, Documentary Heritage Including in Digital Form. https://www.unesco.org/en/communication-information/documentary-heritage

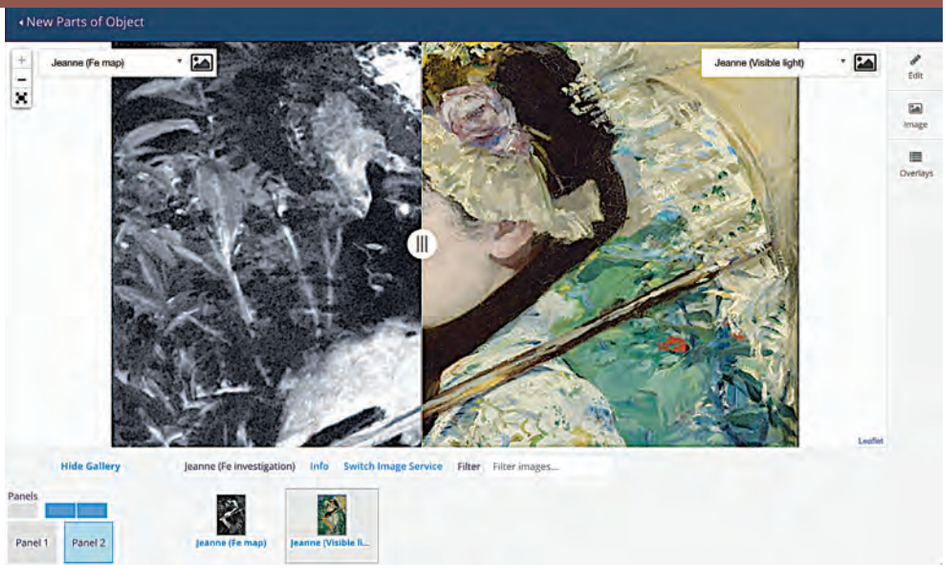
ORGANIZATIONS, NETWORKS & ONLINE RESOURCES

Core Trust Seal. https://www.coretrustseal.org/about/

Data Management Skillbuilding Hub. https://dataoneorg.github.io/Education/

Open Preservation Foundation. https://openpreservation.org/

Research Data Alliance. https://www.rd-alliance.org/about-rda



Still of an image visualization tool in Arches for Science, which allows comparisons of an elemental distribution map and the visible image of *Jeanne (Spring)*, Édouard Manet, 1881. Oil on canvas, 74 × 51.5 cm (29 1/8 × 20 1/4 in.). The J. Paul Getty Museum, Los Angeles, 2014.62.

PUBLICATIONS

"The Convergence of Information Technology, Data, and Management in a Library Imaging Program" by Fenella G. France, Doug Emery, and Michael B. Toth, in *The Library Quarterly* 80, no. 1 (2010), 33–59. https://www.journals.uchicago.edu/doi/full/10.1086/648462

"Digital Archiving in Archaeology: The State of the Art" by Ulf Jakobsson, David Novák, Julian D. Richards, Benjamin Štular, and Holly Wright, in *Internet Archaeology* 58 (2021). https://intarch.ac.uk/journal/issue58/index.html

Digital Humanities, ERCIM News 111, special theme issue coordinated by George Bruseker, László Kovács, and Franco Niccolucci (October 2017). https://ercim-news.ercim.eu/images/stories/EN111/EN111-web.pdf

Implementing Effective Data Practices: Stakeholder Recommendations for Collaborative Research Support by John Chodacki, Cynthia Hudson-Vitale, Natalie Meyers, Jennifer Muilenburg, Maria Praetzellis, Kacy Redd, Judy Ruttenberg, Katie Steen, Joel Cutcher-Gershenfeld, and Maria Gould (September 2020). Washington, DC: Association of Research Libraries. https://doi.org/10.29242/report.effectivedatapractices2020

Introduction to Controlled Vocabularies: Terminology for Art, Architecture, and Other Cultural Works by Patricia Harpring (2013). Los Angeles: Getty Research Institute. www.getty.edu/research/publications/electronic_publications/intro_controlled_vocab/

Introduction to Metadata, Third Edition, edited by Murtha Baca (2016). Los Angeles: Getty Research Institute. https://www.getty.edu/publications/intrometadata/

Linked Open Data: The Essentials. A Quick Start Guide for Decision Makers by Florian Bauer and Martin Kaltenböck (2011). Semantic Web Company. https://www.reeep.org/LOD-the-Essentials.pdf

For more information on issues related to heritage data management, search AATA Online at aata.getty.edu

KATHERINE E. FLEMING
PRESIDENT AND CEO OF THE GETTY TRUST

Photo: Samuel Stuart Hollenshead, @samhollenshead.

On August 1, 2022, Dr. Katherine E. Fleming—an accomplished academic leader and internationally recognized scholar of Mediterranean history, religion, and culture—succeeded the retiring Jim Cuno as president and CEO of the J. Paul Getty Trust, of which the GCI is a part. Cuno had led Getty for eleven years.

Fleming, previously the Alexander S. Onassis Professor of Hellenic Culture and Civilization and Professor of History and Hellenic Studies at New York University, comes to Getty after serving as the NYU provost since 2016.

"Katy Fleming is a distinguished scholar and educator. She is a visionary, experienced leader, with an extensive understanding of global cultures and their importance in uniting all of us," said Getty Board Chair David Lee upon her appointment. "At this critical moment in our world, she is the ideal leader to guide one of the world's largest, most complex cultural organizations, and to continue Getty's trajectory of supporting and sharing visual arts and culture for the greater public good."

In accepting the appointment, Fleming said: "The mission of the Getty is more vitally important than ever, as environmental degradation and global upheaval threaten the world's artistic and cultural heritage in unprecedented ways. Getty's remarkable ability to make an impact in Los Angeles and around the world makes it both a huge honor and responsibility to be asked to take on its leadership. I look forward to working with Getty's many experts to further its mission and to assert the critical relevance of art and the humanities to our diverse shared pasts and our collective future."

Fleming joined NYU in 1998 as an assistant professor, became associate professor in 2004, and was named Onassis professor in 2007. In addition to her appointment in the Department of History, she was an associate in the departments of Hebrew and Judaic Studies and Middle Eastern and Islamic Studies.

Fleming's scholarship has focused on Mediterranean, Jewish, and Greek history and religion. She speaks seven languages and is cofounder of a multiyear oral history project in Greece supported by the Stavros Niarchos Foundation. She earned her BA in religion from Barnard College in 1988, her MA in religion from the University of Chicago in 1989, and her PhD in history from the University of California, Berkeley, in 1995. She began her academic career in the 1990s as a lecturer at Cal State San Bernardino and taught at UC Riverside, Loyola Marymount University, and UCLA before joining NYU.

The recipient of numerous national and international academic honors and awards, Fleming was elected a member of the American Academy of Arts and Sciences in 2021. In Greece, Fleming served as president of the board of the University of Piraeus (2012–16), and she holds honorary doctorates from the University of Macedonia and Ionian University. She was awarded honorary Greek citizenship by the Hellenic Republic in 2015.

GCI News

Project Updates

NEA PAPHOS PROJECT

After a two-year absence due to the pandemic, the GCI resumed fieldwork at Nea Paphos in Cyprus in June 2022. In-depth discussions were held with the Department of Antiquities (DoA) about the project's status, with a focus on the architectural competition for protective shelters and the draft assessment report that forms part of the site's conservation and management plan. Following the project's assessment phase, plans are being developed in four areas: documentation, site management, conservation, and the visitor context. This work was advanced in June, especially in planning for visitor management and site interpretation.

Documentation included additional photogrammetry to produce images of mosaics and other pavements that would otherwise be difficult to photograph overall. Sheltered mosaics pose special challenges because of inconsistent daytime lighting. With assistance from a local photographer, these challenges were addressed by undertaking photogrammetric capture at night with artificial illumination. Eighteen interior mosaics and more than forty additional exterior mosaics and other pavements were documented.

Conservation planning documentation of over a hundred mosaics and other pavements at the site (assessed in 2018 and 2019) was provided to the DoA. The documentation included survey forms used to assess the condition, significance, and degree of exposure of each pavement, and to provide a calculation of priority for conservation. This data was accompanied by GIS-generated thematic maps as a graphic aid to planning future conservation interventions.

The competition to choose a protective shelters design at Nea Paphos reached a milestone in June with selection of the entry from Hugh Broughton Architects, after extensive deliberations by a jury of outside experts and representatives from the GCI and DoA. Six teams had been selected from thirty-six entries in 2020 following a Call for Expressions of Interest. After receiving a design brief and visiting the site, each team submitted a concept design and a video presentation. All the teams produced thoughtful and creative approaches to a complex problem.

Photogrammetric capture being conducted on exterior mosaics at Nea Paphos by GCI staff member Thomas McClintock. Photo: Silvio Augusto Rusmigo, for the GCI.

LOS ANGELES AFRICAN AMERICAN HISTORIC PLACES PROJECT

July 2022 saw the first meeting of the advisory committee of the Los Angeles African American Historic Places project—a collaboration of the GCI and the L.A. City Planning Office of Historic Resources to identify, protect, and celebrate the city's Black heritage.

On July 15, the project's advisory committee met at the Getty Center, with some members participating virtually. The committee agreed to share its varied knowledge and to provide advice and support to advance the project's work. It is composed of members representing various constituencies, including city commissions and professional organizations, and local communities, as well as subject matter experts, including architects, urban planners, public arts and preservation advocates, historians, curators, and storytellers. At the meeting, this multidiscipline, "powerhouse" group enthusiastically expressed their hopes for the project and offered feedback on its strategic plan, goals, and activities, such as the expansion and refinement of the African American History of Los Angeles historic context statement. The next meeting will focus on the integral community engagement strategy as the team moves into the project's initial phase.

Recent Events

TERRA 2022

Terra 2022—the 13th World Congress on Earthen Architectural Heritage—was held in Santa Fe, New Mexico, June 7–10, 2022, at the Santa Fe Community Convention Center. The conference was organized by the GCI, the US National Park Service's Vanishing Treasures Program, and the Stuart Weitzman School of Design at the University of Pennsylvania, under the aegis of the ICOMOS International Scientific Committee on Earthen Architectural Heritage. It marked the fiftieth anniversary of the convening of international meetings on the conservation of earthen heritage and was the first time since 1990 that it was held in the southwestern United States, just over thirty years after Adobe 90, also organized by the GCI and partners. This was the first time since the COVID-19 pandemic that this international group was able to meet in person and remotely, with meaningful exchanges of information, connections, and knowledge sharing.

Two hundred sixty professionals and practitioners in person and eighty virtual attendees from around the world attended the conference. With support from the Getty Foundation, the Chamiza Foundation, and Cornerstones Community Partnerships, fifty Native Americans received funding to attend; through the ICCROM-ATHAR program, fifteen participants from the Middle East and Africa were funded to attend.

Participants at Terra 2022, the 13th World Congress on Earthen Architectural Heritage. Photo: Neil Dixon, for Getty.

The program included keynote and plenary presentations, roundtables, and parallel sessions with more than sixty oral presentations, posters, and videos on archaeological sites, historic buildings and structures, risk and vulnerability, education, care by and for communities, cultural routes and cultural landscapes, and advances in research. The program included visits to earthen sites in and around Santa Fe, giving participants a deeper understanding of the wealth of earthen heritage in the area.

In conjunction with Terra 2022, three laboratory and field workshops were organized by the GCI, the National Park Service, and partners. These workshops provided hands-on training in the materials, construction, and conservation of earthen architecture. One hundred twenty individuals from around the world participated.

AIC AND GETTY

In May 2022 the American Institute for Conservation held its 50th annual conference in Los Angeles, and the GCI, along with Getty colleagues, welcomed attendees to its home community. The conference's opening reception was hosted at the Getty Center on Sunday, May 15, and prior to the reception, tours of Getty conservation studios were offered. As part of the conference, GCI staff organized presentations on plastics repair, microfading testing, use of photogrammetry for surveying and documenting wall paintings, preservation strategies for cellulose ester objects, nanoindentation study of paintings, and technical study of lacquer surfaces. Staff also participated in the poster session with an examination of brass-based paint on gilded wood. The GCI and Getty Publications had booths in the exhibit hall at the conference, held in downtown Los Angeles.

JEANNE MARIE TEUTONICO HONORED BY AIC

Jeanne Marie Teutonico, Associate Director at the Getty Conservation Institute, was honored at the American Institute for Conservation's 50th annual conference, held in Los Angeles. On Saturday, May 14, 2022, Jeanne Marie received the Robert L. Feller Lifetime Achievement Award for her exceptional contributions to the conservation profession over the course of her career.

Jeanne Marie, who has been at the GCI since 1999, has played an instrumental role in developing the Institute's strategic priorities and projects, and in expanding its publications program to serve a diverse international audience. An architectural conservator with over thirty years of experience in buildings and sites conservation, she received an AB in art history from Princeton University and an MS in historic preservation from Columbia University Graduate School of Architecture, Planning, and Preservation. Prior to joining the GCI, she was a conservator and educator on staff of the International Centre for the Study of the Preservation and the Restoration of Cultural Property (ICCROM) in Rome and later of English Heritage in London, where she led a large technical research and publications program. Jeanne Marie has published widely and maintains research interests in the conservation and sustainable use of traditional building materials. She was an invited Resident at the American Academy in Rome and is a Fellow of the Association for Preservation Technology, the Society of Antiquaries in London, and the International Institute for Conservation of Historic and Artistic Works (IIC).

TWENTIETH-CENTURY BUILT HERITAGE IN THE MIDDLE EAST

In partnership with the Department of Culture and Tourism—Abu Dhabi, the GCI's Conserving Modern Architecture Initiative hosted a virtual workshop to introduce participants to *The Twentieth-Century Historic Thematic Framework* (*TCHTF*) and examine how it might be used to identify and protect the Middle East's significant modern heritage. The *TCHTF*—a joint publication of the GCI and the ICOMOS International Scientific Committee on Twentieth Century Heritage—was created as a tool for identifying and contextualizing heritage sites. Its goal is to promote broad thinking about the historical processes that shaped the twentieth-century built environment globally and to support conservation of a wide range of significant heritage places from the era.

The workshop, held May 18 and 25, 2022, included about thirty professionals, including policy makers, academics, and representatives of heritage groups from the region. In the first session, the GCI presented the *TCHTF* and its ten themes. This was followed by speakers who described their experiences applying a thematic approach in Abu Dhabi and Jordan. The stage was set for a lively plenary discussion about modernism and its meaning in the Middle East. In the second session, participants, in small groups, considered how to apply the themes from the framework to places in their own regions and discussed which themes and subthemes applied. The workshop gave the GCI the opportunity to promote this new heritage tool and provided insight into the possibilities and challenges involved in its application.

ENVIRONMENTAL DATA ANALYSIS WORKSHOP

In June 2022 the GCI's Managing Collection Environments (MCE) Initiative and Belgium's Royal Institute for Cultural Heritage (KIK-IRPA) organized a three-day workshop in Brussels, "Facilitating Decision-Making through Analysis of Temperature and Relative Humidity Data." Presented in 2020 as virtual workshops with the American Institute for Conservation, this iteration is the MCE Initiative's first in-person educational offering since the pandemic's onset.

The workshop explored how advanced analysis of commonly collected interior temperature and relative humidity data can further enhance understanding of the collection and building environment, support effective communication with stakeholders, and define context-specific environmental management strategies. Instructors Vincent Laudato Beltran (GCI), Annelies Cosaert (KIK-IRPA), and Geert Bauwens (KU Leuven) discussed data analysis and visualization fundamentals, performance of the building envelope, and a suite of free environmental analysis tools that provide complementary insights into the data. Also presented were case studies and site visits demonstrating the practical application of data collection and analysis for purpose-built museums, historic buildings, collection storage, and transit periods. The workshop's thirty-six participants included collection care managers, conservators, registrars, facility managers, scientists, educators, and students.

While the Initiative remains open to additional virtual or in-person synchronous workshops on environmental data analysis, it is simultaneously developing a free asynchronous course unbound by time and place restrictions. An asynchronous model will offer more equitable educational access to persons with varying learning styles, experience levels, and economic constraints.

NEW PLATFORM FOR AATA ONLINE

AATA Online has successfully migrated ninety years of data to a new cloud-based bibliographic production platform. This move follows AATA's upgrade two years ago to a new user interface. While the change is imperceptible to users, it is significant for the ongoing publication of the resource. The new platform allows AATA staff to create records using a standardized bibliographic format, efficiently add links to full-text articles, conduct authority cleanup projects for better user access, and seamlessly publish new and updated records on AATA's user interface, potentially publishing records faster. The bibliographic format now used will also make sharing records easier, as well as simplify future migrations.

One record-sharing project long on AATA's wish list is to augment AATA's more than 156,000 current records of mostly journal articles with records from the GCI's Conservation Collection, a collection of books and other materials carefully selected by the GCI Information Center's Collection Development Librarian. In the coming year, AATA plans to add over 30,000 of these bibliographic records, the inclusion of which is only possible because of AATA's recent data migration.

UPDATE TO GCI SAMPLES ARCHIVE

In 2013 the GCI established a physical repository of original material samples, along with treatment and reference materials, connected with GCI projects. The purpose of the archive was to centralize storage of sample and reference materials and to improve storage conditions by rehousing samples. The archive and database are an important part of the GCI's history and contribute to a record of projects undertaken since the GCI's founding. A major update to this institutional sample archive and database was recently completed. A FileMaker Pro database was created to facilitate searching of the collection, to generate sample lists, and to link physical material to related project data and reports. This will enhance the finding of detailed information regarding GCI project work. New material is regularly added to the collection and inputted in the database through periodic updates.

View of the GCI's repository of original material samples and treatment and reference materials connected with GCI projects. Photo: Getty Conservation Institute.

GCI GETTY MARROW INTERNS

For many years during summers, GCI staff have supervised undergraduate interns as part of the Getty Marrow Undergraduate Internship program. The aim of the program—named in honor of longtime Getty Foundation director Deborah Marrow, who began the program—is to encourage greater diversity in professions related to museums and the visual arts. It supports substantive, full-time summer work opportunities for undergraduates from backgrounds traditionally underrepresented in the arts. The summer 2022 GCI undergraduate interns were:

Dylan Green

GCI Information Center | University of Southern California | Major/Minors: Archaeology/Cinematic Arts; and Psychology and Law

Dylan assisted with AATA Online, inputting index terms into the AATA database, conducting research to identify articles missing from AATA, scanning articles, and helping with various database cleanup projects.

Elena Prado

GCI Buildings and Sites | University of Southern California | Major/Minor: Architecture/Archaeology

For her internship with the Los Angeles African American Historic Places project—an initiative with the L.A. City Planning Office of Historic

Resources—Elena completed detailed research on the status of potential historic properties previously identified in the 2018 African American Historic Context Statement and helped prioritize them for historic designation consideration.

Elsie Voong
GRI Conservation and Preservation, GCI Science | Cal Poly Pomona | Major/Minor: History/Anthropology
Elsie's internship, shared between the GRI and the GCI, focused on preventive conservation; tasks included cleaning and rehousing architectural models and assisting with assembling the GRI's new microfading tester.

Upcoming Events

GRADUATE INTERNSHIP PROGRAM

Applications are being accepted for the 2023–24 Getty Graduate Internship program. These full-time internships are for students or recent graduates intending to pursue careers in fields related to the visual arts. Programs and departments throughout Getty provide training and work experience in curatorship, education, conservation, research, information management, public programs, and grant making.

The GCI pursues a range of activities dedicated to advancing conservation practice, to enhance the preservation, understanding, and interpretation of the visual arts, and twelve-month internships are available at the Institute. Instructions, application forms, and additional information are available online in the "How to Apply" section of the Getty Foundation website. For further information, contact the Getty Foundation at gradinterns@getty.edu. The application deadline is November 1, 2022.

GCI Graduate Interns 2021–22:

Drew Barnhart | *Columbia University* | Conserving Modern Architecture Initiative

Elena Cofini | *Università degli Studi di Roma "La Sapienza"* | Technical Studies

Joshua Hill | *Courtauld Institute of Art, London* | Tomb of Tutankhamen

Solveig Hoffmann | *Staatliche Akademie der Bildenden Künste Stuttgart* | Cleaning of Wooden Gilded Surfaces

Youkyoung (Jenny) Kim | *University College London* | Managing Collections Environments Initiative

Meg Suhosky | *San José State University* | Colin Williamson Archives

Ana Eduarda Vila-Cha | *Universidade do Minho, Braga, Portugal* | Bagan Conservation Project

GCI Graduate Interns 2022–23:

Michalis Constantinou | *Katholieke Universiteit Leuven, Belgium* | Paphos Conservation and Management Plan

Elsa Haarstad | *School of the Art Institute of Chicago, Illinois* | Conserving Modern Architecture Initiative

Yen Li Jung | *Tainan National University of the Arts, Taiwan* | Cleaning of Wooden Gilded Surfaces/Recent Advances in Characterizing Asian Lacquer

Lauren O'Brien | *Rutgers University, Newark, New Jersey* | Los Angeles African American Historic Places

Margherita Rago | *Universidade do Minho, Braga, Portugal* | Earthen Architecture Initiative/ Seismic Retrofitting Project

Giulia Rioda | *Accademia di Belle Arti di Brera, Milan, Italy* | Modern and Contemporary Art Research

Alessandra Sprega | *University of York, United Kingdom* | Earthen Architecture Initiative/ Earthen Architecture Course

SCHOLAR APPLICATIONS NOW AVAILABLE

The Conservation Guest Scholar Program provides an opportunity for professionals to pursue research on topics that bring new knowledge and fresh perspectives to conservation. Successful candidates are in residence at the Getty Center for three or six months and are chosen by a professional committee through a competitive process. Instructions, application forms, and additional information are available in the "How to Apply" section of the Getty Foundation website. The 2023–24 Conservation Guest Scholar program application deadline is November 1, 2022. For inquiries contact: gcischolars@getty.edu.

GCI Guest Scholars 2022–23

Catherine Mary Clark | *Western Sydney University, Sydney, Australia* | "Faith and Cross-Cultural Approaches to the Conservation of Material Cultural Heritage: Honoring and Learning from Best Practice" | September 26–December 16, 2022

Deborah Schorsch | *Metropolitan Museum of Art, New York* | "The Role of Radiography in the Development of Conservation Theory and Practice" | September 26–December 16, 2022

James Coddington | *Independent Scholar, New York* | "Materials and Meaning in Abstract Expressionist Art" | January 9–March 31, 2023

Karen Mack | *LA Commons, Los Angeles* | "Preserving the Past, Present, and Future: Public Art, Storytelling, and Intergenerational Empowerment" | January 9–March 31, 2023

John Stewart | *Historic England, London* | "Vegetation Management on Archaeological Sites of the Mediterranean" | January 9–March 31, 2023

Jørgen Wadum | *Nivaagaard Collection, Vanløse, Hovedstaden, Denmark* | "Marks and Brands on Sixteenth- and Seventeenth-Century Dutch and Flemish Panel Paintings: History, Meaning, and Digitization" | January 9–March 31, 2023

Rachel Jackson | *GML Heritage, Sydney, Australia* | "A Comparative Analysis Framework and Canberra: A Model Case Study for Twentieth-Century Planned Cities of World Heritage Significance" | April 10–June 30, 2023

Irma Passeri (originally scheduled as a 2019–20 scholar) | *Yale University Art Gallery, New Haven, Connecticut* | "The value of losses in works of art" | April 10–June 30, 2023

Eduardo Luis Rodríguez | *Independent Scholar and Architect, Havana, Cuba* | "Conservation of Modern Movement Architecture in Tropical Regions, Case Study: The Caribbean and Cuba" | April 10–June 30, 2023

Staff Updates

NEVILLE AGNEW RETIRES

Photo: Courtesy of Neville Agnew.

In June 2022 Neville Agnew—a part of the GCI since its earliest days—retired from the Institute. His work for more than three decades in many ways embodied the Institute's development and growth, and thus his departure was a major milestone in GCI's history.

Neville grew up in South Africa, where he earned a PhD in chemistry, a subject he went

on to teach at Rhodes University before moving to Australia in the mid-1970s. In 1980 he was appointed to a new position in materials science and conservation at the Queensland Museum in Brisbane; his work included advising curators on conservation of the museum's natural history, ethnographic, and technology collections, as well as conducting fieldwork on the preservation of fossil tracks and marine shipwreck sites.

In 1986 Neville visited the GCI to participate in an adobe conservation and testing project at Fort Selden, New Mexico. He returned in 1988 to serve as deputy director of the Scientific Program and later became the program's director. In 1991 he was appointed Special Projects director and three years later was made associate director for GCI programs. In the late 1990s he served as group director for the Information and Communications department.

Neville was integral to a multitude of major Institute projects. Starting in 1988, he led work in China at the Yungang and Mogao Grottoes; the over-thirty-year engagement with the Dunhuang Academy at Mogao was ably guided by Neville, who—in conjunction with several dedicated and longtime colleagues—worked with the Academy on projects dealing with site conservation, site management, and wall paintings conservation. The work at Mogao led to the landmark, award-winning 2016 Getty Center exhibition, *Cave Temples of Dunhuang*, with Neville leading the GCI exhibition team in a collaboration with the GRI. In parallel with activities at Mogao, Neville co-led the China Principles project, a collaboration with China's State Administration for Cultural Heritage to develop national guidelines for cultural heritage conservation and management.

Early on Neville worked on rehabilitation of the historic center of Quito, Ecuador, and on reburial and archaeological site preservation research at Chaco Culture National Historical Park in New Mexico. He was also involved in projects in Egypt, among them the conservation and management of the tombs of Nefertari and Tutankhamen, as well as an environmental monitoring study of the Great Sphinx at Giza. In the mid-1990s he led—again with the dedicated engagement of GCI colleagues—the joint GCI-Tanzania project to preserve the 3.6-million-year-old fossil hominid footprint trails at Laetoli.

Neville initiated early GCI efforts to assist Iraqi cultural authorities following the Iraq War by working with the World Monuments Fund to create a national heritage information system. While political and security conditions made progress slow, a similar initiative was undertaken in Jordan, and that effort spawned the GCI's Arches Project, an open-source software platform for cultural heritage data management now utilized by many heritage organizations around the world.

More recently, in addition to continuing work in China on the Gansu Grotto guidelines, Neville guided GCI initiatives in the conservation and preservation of rock art. This included leading our Southern African Rock Art Project, followed by his work with the Rock Art Network, an international network of organizations and professionals focused on the preservation of rock art. Throughout it all, Neville contributed to countless conference proceedings, journal articles, and books. His literary efforts will continue into retirement with several writing projects to wrap up, and he plans to remain active in his areas of interest, including rock art.

His intellectual curiosity, his drive, and his passion for excellence in the preservation of heritage characterize the tremendous contribution he has made to the field, as well as to our own work. His retirement is well earned, but we will miss having regular access to the insights, perceptions, and dedication he brought to every project of which he was a part.

CYNTHIA GODLEWSKI RETIRES

Cynthia Godlewski, who led the GCI publications program for many years, retired from the Institute in July, ending a nearly thirty-year tenure with the Institute.

After an early career in public relations and freelance writing, Cynthia joined the GCI in April 1992 as a consultant editor for what was then the Special Projects department. She continued in this capacity until 1998 when she was hired as a full-time research associate in Field Projects, where she was responsible for writing and editing text, selecting images, and coordinating the design and production of didactic materials. She also produced and edited content for exhibits that explained conservation to an international audience. Projects in which she was involved included the GCI's work at Laetoli in Tanzania, Abomey in Benin, The Last Judgment mosaic in Prague, the Mogao Grottoes in China, and the historic city of Quito, Ecuador.

Photo: Anna Flavin, GCI.

In March 2001 Cynthia briefly left the GCI to return to public relations but returned in August 2002 as a GCI publications specialist, focused on reinvigorating the Institute's Readings in Conservation series. Gradually, she assumed responsibility for all GCI publications and remained in that role until retirement, with promotions to senior project manager and more recently to lead editor, in recognition of her increasing responsibilities.

Under Cynthia's leadership, the scope and output of GCI Publications grew. By her retirement, Cynthia had worked on more than seventy-five books published through Getty Publications. She also expanded the GCI's internal publications program. Through it all, Cynthia displayed both the ability to think strategically and a keen attention to detail—the quality and quantity of the books produced under her leadership reflect this. A collaborative colleague, she developed and cultivated working relationships at the Getty and with authors around the world.

Cynthia will be greatly missed, but her contribution to the expansion of conservation literature is lasting. We wish her the best in this new phase of her life.

Print & Online Publications

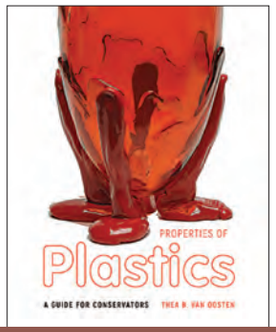
Print publications are available for purchase at shop.getty.edu. Online publications are available free at getty.edu/conservation.

PRINT

Franz Kline: The Artist's Materials

Corina E. Rogge with Zahira Véliz Bomford

Although Franz Kline was one of the seminal figures of the American Abstract Expressionist movement, he is less well known than contemporaries such as Jackson Pollock and Willem de Kooning. This is partly because Kline, unlike most artists in his circle, did not like to write or talk about his art. When asked in a panel to discuss abstract art, Kline said, "I thought that was the reason for trying to do it, because you couldn't [talk about it]." Still, his impact was such that the critic and art historian April



Kingsley wrote, "Abstract Expressionism as a movement died with him."

This volume, the latest in the GCI's Artist's Materials series, looks at Kline's life and work, from his early years in Pennsylvania to his later success in New York City. His iconic paintings are poised on a critical cusp: some have already undergone conservation, but others remain unaltered and retain the artist's color, gloss, and texture, and are surprisingly vulnerable. The authors' presentation of rigorous examination and scientific analysis of more than thirty Kline paintings from the 1930s through the 1960s offers invaluable insight into his life, materials, and techniques. This study provides conservators with essential information that will shape future strategies for the care of Kline's paintings.

PRINT

Properties of Plastics: A Guide for Conservators

Thea B. van Oosten

Almost every museum in the world includes plastics in their collections. Research initiatives and knowledge concerning conservation of heritage objects made of plastics have proliferated in the last twenty-five years, necessitating this up-to-date, comprehensive resource. A practical guide for the conservation community, this authoritative book offers information essential to understanding plastics, polymers, and rubber/elastomers and their behaviors in the cultural heritage context. Graphs, diagrams, and illustrations allow readers to compare the mechanical, physical, thermal, and optical properties of these substances during conservation. This book will assist museum professionals in choosing the appropriate methods and materials for preserving and treating plastic objects.

Complementing the main chapters, fifty-six illustrated "fact sheets" summarize the properties of those plastics commonly found in museum collections. Six case studies present real-world examples of current conservation approaches to works of art and design made of plastics and rubber/elastomers. Authored by Thea B. van Oosten—conservation scientist, educator, and internationally regarded authority on the behavior and properties of plastics—this instructive volume is destined to become an invaluable resource.

ONLINE

Seismic Retrofitting Project: Simplified Calculations for the Structural Analysis of Earthen Historic Sites

Spanish Edition

Paulo Lourenço, João Pereira, and Daniel Torrealva | In collaboration with Maria Pia Ciocci, Federica Greco, Giorgos Karanikoloudis, and Claudia Cancino, 2022

This publication, originally published in English, is now available in Spanish. It is designed to assist engineering professionals in the assessment and analysis of historic earthen structures using simplified calculations. Based on simple calculations developed as part of the Testing and the Modeling phases of the GCI's Seismic Retrofitting Project (SRP) by the Facultad de Ciencias e Ingeniería at the Pontificia Universidad Católica del Perú in Lima, and TecMinho at the University of Minho, Portugal, respectively, this volume develops a blueprint assessment approach to provide a simpler, faster, and lower-costing analysis for immediate screening of historic earthen buildings. This structural assessment, based on a simplified geometric approach, also helps conservation professionals to prioritize further studies—if necessary—with respect to the seismic vulnerability of buildings. Several application examples are provided in the report regarding the different analysis methods used. This publication is the last in the SRP series on the safety assessment of historic earthen sites. Other series reports are *Recommendations for Advanced Modeling of Historic Earthen Sites* and *Modeling of Prototype Buildings*.

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

CONSERVATION PERSPECTIVES
THE GCI NEWSLETTER

VOLUME 37 • NUMBER 2 • FALL 2022

Conservation Perspectives, The GCI Newsletter is distributed free of charge twice a year to professionals in conservation and related fields and to members of the public concerned about conservation. Back issues of the newsletter, as well as additional information regarding the activities of the GCI, can be found in the Conservation section of the Getty's website, getty.edu/conservation.

The Getty Conservation Institute (GCI) works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research, education and training, field projects, and the dissemination of information. In all its endeavors, the GCI creates and delivers knowledge that contributes to the conservation of the world's cultural heritage.

The GCI is a program of the J. Paul Getty Trust, a cultural and philanthropic institution dedicated to the presentation, conservation, and interpretation of the world's artistic legacy.

MIX
Paper
FSC® C103525

Getty Conservation Institute
1200 Getty Center Drive, Suite 700
Los Angeles, CA 90049-1684
Tel 310-440-7325
Fax 310-440-7702
gciweb@getty.edu
getty.edu/conservation

CONSERVATION PERSPECTIVES
THE GCI NEWSLETTER

A data visualization that summarizes pigments identified by different analytical techniques in *The Martyrdom of Saint Lawrence*, Pacino di Bonaguida, about 1340. Tempera and gold leaf, Leaf: 19 × 20.8 cm (7 1/2 × 8 3/16 in.). The J. Paul Getty Museum, Los Angeles, Ms. 80b, verso, 2006.13.verso. Image: Catherine Patterson, GCI, ©The J. Paul Getty Trust.

Conservation
Research
Foundation
Museum