# COPY CULTURE

## Sharing in the Age of Digital Reproduction

Edited by
Brendan Cormier

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The text herein is the result of an extensive global consultation on the occasion of the 150th anniversary of the 1867 Henry Cole Convention for Promoting Universally Reproductions of Works of Art for the Benefit of Museums of All Countries. The Convention, inspiring in its clarity, practicality and openness to the creation and sharing of reproductions, served as the basis for the establishment of this new ReACH Declaration. The ReACH Declaration for Promoting Universally the Reproduction, Storage and Sharing of Works of Art and Cultural Heritage Through Digital Technology was adopted at the final ReACH roundtable held at the Victoria and Albert Museum in London on 8 December 2017.

DEFINITIONS

ReACH stands for Reproduction of Art and Cultural Heritage.

Work means a work of art or other cultural item. The term Work is intended to be broadly construed and includes, but is not limited to, works of art in all media and eras, e.g. paintings, works on paper, sculptures, murals, antiquities, monuments, architecture and architectural elements, and archaeological sites.

Endangered Work means Work threatened by environmental hazards, conflicts, terrorism, mass tourism and other natural and human-made disasters.

Steward means any governmental or private entity that owns or possesses Works held for the benefit of the public. The term Steward is intended to be broadly construed and includes, but is not limited to, museums, sites, monuments, libraries, repositories, archives, places of worship, whether governmental, sovereign or private.

Record means a digital recording or reproduction of a Work and the data generated in the process of faithfully capturing images and data of the Work so as to create a high quality digital or physical reproduction of the Work.

High quality means a level of quality sufficient to constitute a representation of a Work as faithful as possible.

VISION

This declaration promotes the vision that works of art and cultural heritage should be preserved and shared as widely as possible throughout the world.

Through advances in technology and connectivity, we now have a revolutionary opportunity to enhance learning, creativity and innovation, and to reach new audiences worldwide, through the reproduction and sharing of works of art and cultural heritage ('Works'). Furthermore, digital technologies can enable us to record, document and, in some instances, recreate Works that are threatened by environmental hazards, conflicts, terrorism, rapid economic development, mass tourism, thefts and other natural and human-made disasters ('Endangered Works') or that have been lost.

For cultural institutions that hold collections for the benefit of the public, the opportunity to provide open access now or in the future to Works in a digital format is an exciting new frontier in their mission to preserve and transmit knowledge, culture and history for present and future generations. Such opportunities also present responsibilities. Digital Records need to be responsibly created and safeguarded for the long term to ensure integrity as well as retrieval and reuse by future generations. Furthermore, as the means and skills required to use and access digital technology are not distributed evenly around the world, it is incumbent on those with the capacity to do so to provide support and training to those with fewer resources.

This Declaration is intended for both institutions and individuals to promote the production, sharing and preservation of digital records and reproductions ('Records'). Owners and Stewards of Works and others involved in the process of generating these Records are encouraged to disseminate and use the ReACH Declaration as widely as possible.

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## REPRODUCTION

Art. 1　Stewards of Works are encouraged, for the benefit of the public of today and future generations, to take advantage of technological advances to create Records of Works entrusted to their care, for purposes of documenting and preserving all Works but in particular Endangered Works.

Art. 2　Those involved in the process of documenting and producing digital Records are encouraged to work to then-current accepted standards that will support academic study and monitoring the condition of the original object.

Art. 3　The process of documenting and producing Records should be non-invasive for the Works involved. The preservation of the Work itself remains of paramount importance. Digital Records are a tool that can support preservation but are not a substitute for preservation.

Art. 4　The process used to produce Records as well as the intended purpose for each specific Record should be documented to enable better usage and interpretation of such Records today and for future generations.

Art. 5　Before making and sharing Records, the historic context of and possible cultural and national sensitivities about the Works should be considered, as well as applicable legal and ethical constraints, and the rights of donors and third parties. Transparency and participation by communities or cultural groups with ties to the Works should be encouraged.

## STORAGE

Art. 6　Digital Records should be contemporaneously archived and maintained by the Steward of the Work. The Works should be recorded in a manner that renders them likely to be retrievable and reproducible even if technology changes. Enabling the data migration on a continuous basis is of paramount importance.

Art. 7　The Steward of the Work should own or, at a minimum, retain unrestricted and perpetual rights to use, reproduce and share the Records, unless applicable law or a contractual agreement requires otherwise.

Art. 8　Digital Records should be linked to metadata that enriches the digital asset for research, education and preservation.

Art. 9　Digital and Physical Records should be marked or otherwise identified as copies using methods that are sustainable and, to the extent feasible, do not rely on technologies that may become obsolete. Those involved in the process of making these Records are encouraged to develop an international system to identify copies.

## SHARING

Art. 10　Stewards of Works are encouraged to make Records freely available to the public for personal use and enjoyment and for non-commercial research, educational, scientific and scholarly uses.

Art. 11　Stewards of Works and other parties involved in the process of documenting and producing Records are encouraged to share those Records of Works as widely as possible, but in particular to reach new audiences, especially people with special needs. This includes, where possible, proactively addressing issues of equal access to digital technology on a global scale.

Art. 12　Stewards of Works and other parties involved in the process of documenting and producing Records of Works are encouraged to use established and standardized licensing schemes and symbols that convey to the public the manner in which the Records of Works may be shared and reused, including open access content.

Art. 13　When Records are shared and disseminated, Stewards of Works involved should provide attribution to the original author of the Works and, where practicable, provide credit to those involved in the process of documenting and producing Records of Works.

Art. 16　Stewards of Works and other parties engaged in making Records are encouraged to work collaboratively to develop compatible systems to enable the exchange of recorded data and metadata on a global scale. A set of specific technological standards and practical guidelines will be produced by a ReACH technical committee. These standards and guidelines will be revised as technology evolves.

Art. 17　In light of the major infrastructure requirements to ensure long-term preservation and migration of digital Records, public–private partnerships should be encouraged as well as collaborations between countries.



‘Works [...] should be preserved and shared as widely as possible.’

Search　'works, shared'

Result　*Landscape with cattle at a stream*
Eduard Schleich, c.1850

Source　V&A online collections

TRISTRAM HUNT
Victoria and
Albert Museum

JEAN-LUC
MARTINEZ
Louvre Museum

MIKHAIL
PIOTROVSKIY
The State
Hermitage
Museum

SAIF SAEED
GHOBASH
Abu Dhabi
Department
of Culture
and Tourism

BILL SHERMAN
The Warburg
Institute

AMY MEYERS
Yale Center
for British Art

TONY ELLWOOD
National Gallery
of Victoria

JOHANNES VOGEL
The Natural History
Museum, Berlin

LAURYN
GUTTENPLAN
The Smithsonian
Institution

POLINA FILIPPOVA
Peri Foundation

ADAM LOWE
Factum Arte

WIM PIJBES
Emeritus Director,
Rijksmuseum

MAX HOLLEIN
Fine Arts Museums
of San Francisco

DR SHAN JIXIANG
The Palace
Museum

STEFAN SIMON
Global Cultural
Heritage Initiatives,
Yale University

AXEL RÜGER
Van Gogh Museum

JOHN LEIGHTON
National Galleries
of Scotland

STEPHEN J.
KNERLY, JR.
Hahn Loeser
& Parks LLP

MERETE
SANDERHOFF
Statens Museum
for Kunst

HELTMUTH
TRISCHLER
Deutsches Museum

PEPE SERRA
Museu Nacional
d'Art de Catalunya

JOSEF
HELFENSTEIN
Kunstmuseum
Basel

SABYASACHI
MUKERJEE
Chhatrapati
Shivaji Maharaj
Vastu Sangrahalaya

Copy Culture:
Sharing in the Age
of Digital Reproduction

Edited by Brendan Cormier

*Copy Culture* is a result of ReACH (Reproductions of Art and Cultural Heritage), an initiative spearheaded by the Victoria and Albert Museum with the Peri Foundation, to bring museums and cultural heritage practitioners together to collectively draw a roadmap for the future production and use of digital copies.

The book is also a live experiment in using open-access imagery. Throughout the book, we have searched open-access collections from around the world by using text directly taken from essays and interviews. The result is a free-association juxtaposition of ideas expressed in the book, with resulting images from museum collection queries around the world.

Tristram Hunt

Page 10

'... a significant and timely reminder of the shared links between our cultures, their interconnected values and the collective responsibility we all have towards them.'

| | |
|---|---|
| Search | 'significant and timely' |
| Result | Handkerchief c.1783, Alsace, France |
| Source | V&A online collections |

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Brendan Cormier and Anaïs Aguerre

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'[Museums] are far more ensconced in the conservation and circulation of copies than we might think.'

Search    'circulation of copies'

Result    *Etudes de Dessins d'après l'Antique et les Grands Maîtres*
          Adolphe Bilordeaux, 1864, Paris

Source    V&A online collections

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## MAKE

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## STORE

## SHARE

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## USE

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Brendan Cormier and Anaïs Aguerre

Page 20   'The proliferation of images
of works of art, in fact, has
become a significant driver
for going to museums'

Search      'proliferation of images'

Result      Portrait miniature of Elizabeth I
            Nicholas Hilliard, *c.*1600, England

Source      V&A online collections

# Forewords



Brendan Cormier and Anaïs Aguerre

'... the impulse to record should never outweigh asking the fundamental questions of why and how.'

Search      'to record should never'

Result      *Sketch of a Letter-Writer*
            Richard Dadd, 1842-3

Source      V&A online collections

This book represents the culmination of research and discussions held over the past year for ReACH (Reproductions of Art and Cultural Heritage), a global initiative spearheaded by the V&A, in partnership with the Peri Foundation, concerning digital reproductions. It has brought together the global museum and heritage community to explore how our imperilled cultural heritage can be preserved in our digital era of 3D printing, ultra-high resolution scanning, and drone technology, and to debate the creative opportunities that copying these works offers a global audience.

In 1867, the V&A's founding Director, Henry Cole, showed great foresight with his 'Convention for Promoting Universally Reproductions of Works of Art', which called for the 'mutual exchange of copies'. Plaster casts, electrotypes and photographs were shared across European collections for widespread educational benefit.

150 years later, and in the face of myriad destructive forces that threaten our cultural heritage, we initiated ReACH to pen a new declaration as a roadmap for how institutions can both share cultural heritage and safeguard against its loss through the production of digital copies. With each discussion, we came closer to redrafting Cole's Convention, unveiling a final declaration in December 2017: a twenty-first-century blueprint for

navigating the future role of reproductions, available to everyone who has a stake in our cultural heritage.

ReACH has been <u>a significant and timely reminder of the shared links between our cultures, their interconnected values and the collective responsibility we all have towards them</u>. Thank you to the Peri Foundation, without whom this initiative would not have been possible. A special thank you also to the Smithsonian Institution, the State Hermitage Museum, the Abu Dhabi Department of Culture and Tourism, Louvre Abu Dhabi and the Palace Museum for their wonderful collaboration in hosting the ReACH roundtables.

Finally, thank you to the experts who joined the ReACH dialogue and contributed.

The PERI Charitable Foundation was set up to promote education, the latest technologies and culture. Our partnership with the V&A in the ReACH project is in line with these goals. The PERI Foundation is involved in a number of significant projects keeping cultural heritage alive employing cutting-edge technologies and educating young people in their use and importance.

The digitization of cultural and historic artefacts can substantially add to the level of interest among young people, and the ReACH initiative, spearheaded by the V&A, represents an important step in increasing access to cultural heritage for everyone.

ReACH is a very timely initiative. It not only addresses the growing dangers for cultural heritage presented by terrorism, climate change and mass tourism, but it also draws the attention of the international community to the great opportunities provided by new technologies to make the cultural experience more interactive and meaningful. It contributes to an enrichment of the cultural and scholarly inheritance of all humanity.

Tristram Hunt

Director
The Victoria and Albert Museum

Dmitry Tomchuk

CEO
Peri Foundation

# Convention for Promoting Universally Reproductions of Works of Art for the Benefit of Museums of all Countries

1867, Paris
Exposition Universelle

Throughout the world every country possesses fine Historical Monuments of Art of its own, which can easily be reproduced by Casts, Electrotypes, Photographs and other processes, without the slightest damage to the originals.

(a)     The knowledge of such monuments is necessary to the progress of Art, and the reproductions of them would be of a high value to all Museums for public instruction.

(b)     The commencement of a system of reproducing Works of Art has been made by the South Kensington Museum, and illustrations of it are now exhibited in the British Section of the Paris Exhibition, where may be seen specimens of French, Italian, Spanish, Portuguese, German, Swiss, Russian, Hindoo, Celtic and English Art.

(c)     The following outline of operation is suggested:

I.     Each Country to form its own Commission according to its own views, for obtaining such reproductions as it may desire for its own Museums.

II. The Commissions of each Country to correspond with one another and send information of what reproductions each causes to be made, so that every Country, if disposed, may take advantage of the labours of other Countries at a moderate cost.

III. Each Country to arrange for making exchanges of objects which it desires.

The following Princes have already signed this Convention:

GREAT BRITAIN
 AND IRELAND
Albert Edward,
 Prince of Wales
Alfred, Duke of Edinburgh

PRUSSIA
Frederick-William,
 Crown-Prince of Prussia

HESSE
Louis, Prince of Hesse

SAXONY
Albert, Prince Royal
 of Saxony

FRANCE
Prince Napoléon (Jérome)

BELGIUM
Philippe, Comte de Flandre

RUSSIA
The Césarevitch
Nicolas,
 Duc de Leuchtenberg

SWEDEN AND NORWAY
Oscar, Prince of Sweden
 and Norway

ITALY
Humbert, Prince Royal
 of Italy
Amadeus, Duke of Aosta

AUSTRIA
Archduke Louis Charles
 of Austria
Archduke Rainier of Austria

DENMARK
Frederik, Crown Prince
 of Denmark
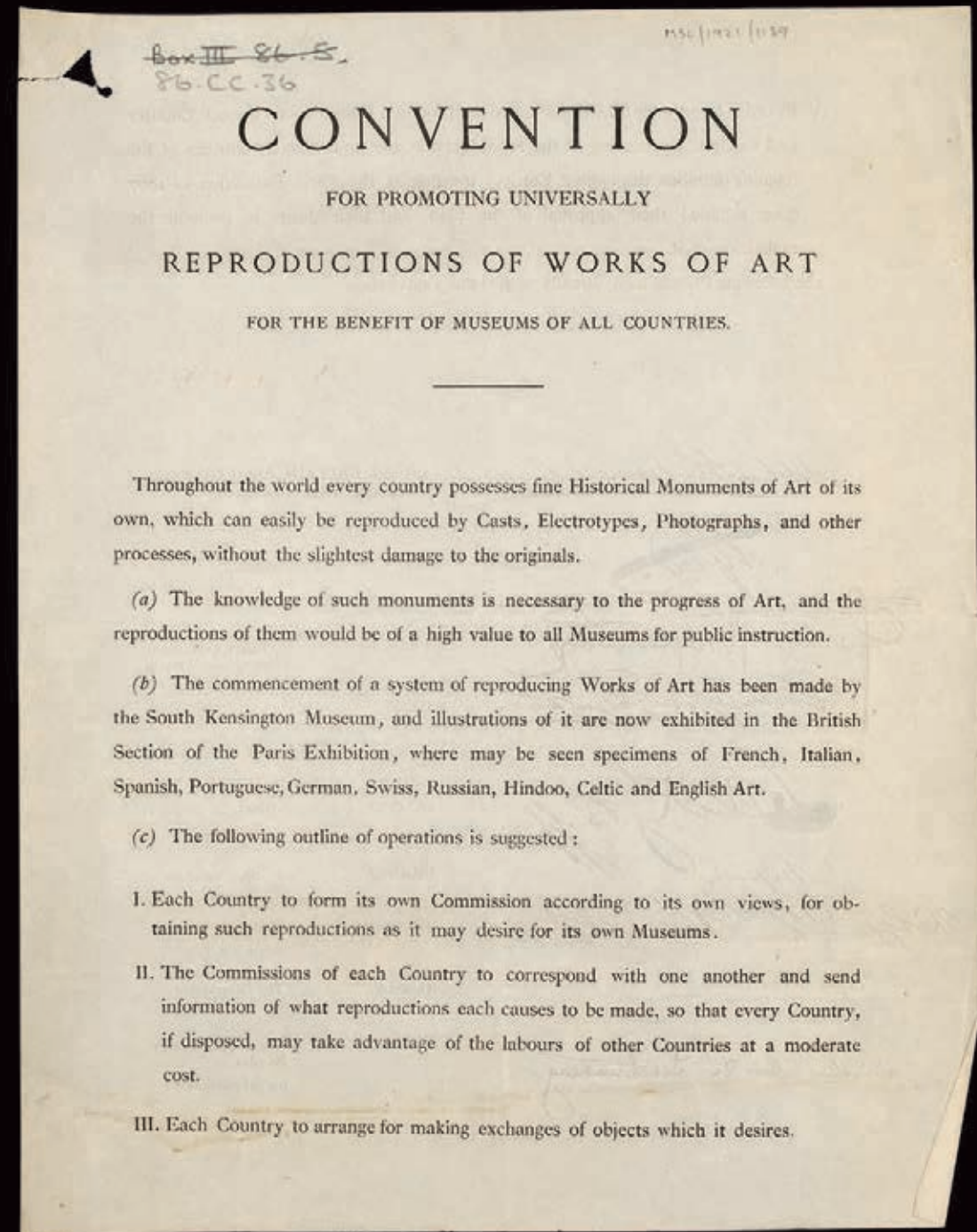
IV. In order to promote the formation of the proposed Commissions in each Country and facilitate the making of the reproductions, the undersigned Members of the reigning families throughout Europe, meeting at the Paris Exhibition of 1867 have signified their approval of the plan, and their desire to promote the realisation of it.

The following Princes have already signed this Convention :

| Signature | Country | Name |
|---|---|---|
| *Albert Edward P.* | GREAT BRITAIN and IRELAND. | Albert Edward, Prince of Wales. |
| *Alfred.* | " | Alfred, Duke of Edinburgh. |
| *Friedrich Wilhelm* | PRUSSIA. | Frederick-William Crown-Prince of Prussia. |
| *Ludwig* | HESSE. | Louis, Prince of Hesse. |
| *Albert* | SAXONY. | Albert, Prince royal of Saxony. |
| *Napoléon* | FRANCE. | Prince Napoléon (Jérôme). |
| *Philippe, comte de Flandre* | BELGIUM. | Philippe, Comte de Flandre. |
| | RUSSIA. | The Césarevitch. |
| *Nicolas Duc de Leuchtenberg* | " | Nicolas, Duc de Leuchtenberg. |
| *Oscar, Prince of Sweden & Norway* | SWEDEN and NORWAY. | Oscar, Prince of Sweden and Norway. |
| *Humbert de Savoie* | ITALY. | Humbert, Prince royal of Italy. |
| *Amédée de Savoie* | | Amadeus, Duke of Aosta. |
| *Frederik Crown Prince of Denmark* | | |

# Introduction

## Anaïs Aguerre
## and Brendan Cormier

We don't tend think of museums as storehouses of copies. Rather, we go to them to see the real thing: virtuosic works of art, painted, sculpted and crafted by the hands of great makers over the centuries. We seek out originals, presumably, to bathe in the warm glow of their aura, to come as close as possible to a historical time and place, and to revel in the experience of a unique and irreplaceable object. After all, in a world of seemingly frictionless reproduction, originals have become a rare commodity, their numbers decreasing in proportion to an ever-growing number of digital and physical copies.

Copies, for this very reason, are a bit of a dirty word: they are seen as cheap, vulgar and fake. At their worst, they take on the form of the forgery, an unethical attempt to pass for an authentic work, punishable by law. A gentler form of critique sees them rather as a pest: proliferating both materially and digitally, polluting our collective visual landscape with poor renditions and tacky applications (a Mona Lisa coffee mug, anyone?).

Yet as much as museums do brave and valiant work, collecting, maintaining and displaying originals, they are far more ensconced in the conservation and circulation of copies than we might think. Peering into this world reveals a far more complex relationship: a copy has a symbiotic role that rather than degrade the value of an original, works to exalt and preserve it.

Look behind the scenes, and you'll see how museums employ dedicated photography and scanning specialists to record and document their collections, working at a furious pace, with the goal to record everything the museum owns. Through this work, millions of digital files are being produced and stored on massive server farms; complex digital asset management systems are being constructed to control the flow of information, and website portals are being refined and tweaked; all so that museum professionals and the broader public of Internet users can access cultural heritage through digital copies. As museums expand and grow across the globe, a parallel world of digital copies grows along with it.

Digital copy-making is also improving: becoming more faithful to the original, higher in resolution, capturing details naked to the human eye. This is not just restricted to the flat images we see on our screens, but also the world of three dimensions. Any moderately tech-savvy person can now walk into a museum, and using just their smartphone, take multiple pictures of an object (provided you can walk all around it), feed it through some software, and create a fairly faithful digital model. Websites like Scan the World and Sketchfab are growing exponentially in content, with the simple mission to host the 3D creations of hobbyists and professionals alike. Museums too are adapting by creating their own 3D studios, building a library of mesh files and point cloud data – the DNA of any three-dimensional image – which could one day rival the collection of 2D digital images currently being made. It can seem downright Sisyphean at times: once a complete collection of reproductions in one format is achieved, a newer higher-quality format arrives, and the task must start afresh.

So why go to the trouble? Why amass such large reserves of digital content, in various formats? To answer that, you might start by asking yourself where you first encountered a famous work of art. Odds are, you saw it first as a reproduction: online, in print, in a film or on a poster. The proliferation of images of works of art, in fact, has become a significant driver for going to museums – the opportunity to see the original, finally, after having seen the reproduction so many times over. The value of any given work, for better or worse, might even be measured more by the extent of its reproduction, than of its art-historical merit. The reproduction has a very real currency.

But beyond simply increasing footfall, museums are interested in copies for fundamental reasons concerning access and learning. Museums emerged in the eighteenth and nineteenth centuries with the mission to serve a broad public, to give access to great works of art, for both pleasure and education. It was especially so in Victorian England, where a reformist attitude took hold: museums were tasked with doing nothing less than improving all of society. Specific measures were taken to ensure that every social class had access. Gas lighting, for instance, was introduced early on, so that museums could stay open late, providing the opportunity for labourers to visit those hallowed halls. The V&A itself established a circulation department in the 1920s, so that its collection could travel to different towns and cities across the country: it was not just Londoners who should reap the benefits of such cultural amenities, but the entire nation. Fast forward a century, and we can now view the museum as having a world-wide audience. With the explosion of global tourism, and ever-increasing Internet connectivity, museums are harnessing the power of their online platforms to build their reputations and provide unprecedented access to their collections across the planet.

Copies also play a significant role in stemming the tide of loss and degradation. Museums are charged with keeping objects forever. But all artefacts are susceptible to damage and the deteriorating vicissitudes of age. For this reason, digital records have become of increasing interest for conservation departments, keen to keep precise data on the state (and changing state) of an original. The copy acts as a valuable resource from which to base important conservation decisions. In certain, more tragic cases, copies have served as the only surviving record when an original object is lost. This was highlighted most brutally during the ISIS occupation of parts of Syria and Iraq, when several iconoclastic acts led to the destruction of World Heritage sites. Digital archaeologists, using tourist photography and museum images, were able to reconstruct several of the lost and damaged artefacts. As a result, scanning is increasingly seen as a pre-emptive measure to safeguard against destruction.

THE 1867 CONVENTION, AND TOWARDS A NEW CONVENTION

While the possibilities of digital reproduction are incredibly exciting, it's important to remember that in many ways, we've been here before. Copies once helped form an important part of many early museum collections. This was especially the case for the V&A, where in its first decades, the museum actively commissioned and displayed copies in the form of plaster casts, electrotypes and photographs. During the construction of the museum, two enormous courts were

designed and designated for the display of plaster cast copies of statues and architectural details. The logic behind collecting casts was simple: the museum wanted to show its audience the greatest works of art in the world; architecture and statuary being generally immovable, and owned by other nations, the museum's response was simply to copy them. The crowning achievement for the V&A was the cast of Trajan's Column, erected at the museum in 1864. Towering so high that it had to be chopped in two to fit the already cavernous space of the courts, the cast showed, and continues to show, how an architectural copy can resonate with its own unique presence and aura, separate from its original in Rome. During the second half of the nineteeth century, museums around the world participated in the commissioning and collecting of casts. A thriving economy of professional casters grew, producing vast catalogues of disembodied plaster copies, for sale to the highest bidder. The trend came to a halt at the beginning of the twentieth century, with many curators and museum directors beginning to view cast courts as vulgar and lacking in value. Sadly, many cast collections were discarded wholesale from museums, making the surviving cast collections today all the more curious and valuable.

Museums also experimented with other novel reproduction technologies at the end of the nineteenth century. One such method was called electrotyping, whereby a mould was dipped into an electrolyte bath which, when charged with an electric current, would deposit a thin layer of metal onto the mould, creating a microscopically perfect copy. The V&A partnered with a commercial manufacturer called Elkington & Co. to produce hundreds of metal copies of assorted objects, including goblets, tables and basins. Elkington also ended up selling many of these copies to film studios, and so museum copies have gone on to leave their impression in film history. Copies of V&A electrotypes have been spotted in film classics like *Ben Hur*, *Indiana Jones* and more recently *Game of Thrones*.

The museum was also an early adopter of one of the most radical reproduction technologies of the nineteenth century: photography. It established its own photographic studio in 1856, with the museum's founding Director Henry Cole appointing his brother-in-law Charles Thurston Thompson to be the first official photographer. Thompson oversaw the production of over 10,000 negatives, of works from the collection and on loan, but also of architectural, figurative and decorative works in various sites around the world. The photography collection served many fronts: as a way of documenting what the V&A owned, as an easy-to-distribute educational tool (photographs being easier to move than casts), but also as artistic works in their own right, highlighting how copies carry their own unique expressive signature.

In 2016, sensing that there was an important relationship to be drawn between the nineteenth-century history of copying, and emerging twenty-first-century digital technologies, the V&A curated and produced the exhibition *A World of Fragile Parts* at the Venice Biennale of Architecture, in collaboration with La Biennale di Venezia. The show traced both the history and original ambition of the museum's copying practices, while pointing out an unexpected role these copies ended up playing: preservation. Copies unintentionally acted as back-ups. As various forces wreaked damage and destruction on originals (pollution, war and accident), the museum was diligently conserving and preserving their copies. As a result, in some cases, these copies have in a way outperformed their originals, having suffered less decay, and thus remaining truer to the original from 150 years ago than the original today.

In the exhibition, nineteenth-century copies were then contrasted with a section showing twenty-first-century initiatives, in which each explored different aspects of the potential for digital copies. As this was a period following the iconoclastic acts of ISIS, many projects focused on how digital tools could be harnessed to recreate lost artefacts. Morehshin Allahyari digitally remodelled figures from Hatra, embedding within 3D resin prints a USB stick containing the source material she used to make her objects. Project Mosul (Rekrei), on the other hand, scoured the Internet for imagery of lost artefacts, often taken by tourists, to reconstruct models through a process of photogrammetry. Other projects looked at freezing ephemeral moments in time. Forensic Architecture took four different bombing sites in the Middle East and modelled the resulting plume clouds; Sam Jacob Studio took a temporary shelter from a refugee camp outside Calais and monumentalized it by milling a new version out of synthetic stone. Other projects called for more open sharing of 3D models. Scan the World, for instance, offers a platform for anybody to upload their own 3D scans of statues and works of art. '#NefertitiHack' was a staged 'ethical art heist', where Nora Al-Badri and Jan Nikolai Nelles surreptitiously obtained a 3D file of the bust of Nefertiti and released it publically as a torrent file online. The projects all suggested that 3D reproductions represent a rich and complicated terrain – one that we have only just begun to explore.

At the centre of the exhibition was a single document, Henry Cole's 1867 'Convention for Promoting Universally Reproductions of Works of Art for the Benefit of all Countries'. The document laid out, in concise and simple terms, the immense cultural value of sharing reproductions, and called for a system of collaboration, where countries could openly and easily exchange copies with each other. While attending the Paris Expo of the same year, Cole was able to charm several princes from across Europe to sign the document. The document

is remarkable, in one sense, because it presages by 150 years the enormous energy today in arguments being made for more open systems of exchange, such as those laid out by Creative Commons, OpenGLAM, and Europeana. For this reason, at the end of the exhibition, we asked participants to consider what an updated version of the convention might include today, given the new opportunities that our technological landscape provides. This planted the seeds for thinking how we might go about actually rewriting Henry Cole's convention, especially considering the fortuitous timing that 2017 would mark the document's 150th anniversary.

THE REACH DECLARATION

Following the closing of the exhibition in November 2016, the Peri Foundation approached the V&A, via Adam Lowe – who also participated in the exhibition – with the suggestion that we collectively and formally attempt to rewrite the convention, which we would go on to call ReACH (Reproductions of Art and Cultural Heritage).

It was interesting to think about: not just in terms of how the content of such a document might change and evolve to reflect the realities of today, but also how the format for drafting it should differ. In all likelihood, Henry Cole wrote the original convention on his own, and given its brevity, probably over the course of a single day. He also appealed exclusively to royalty to sign it, rather than the museums and institutions that actually oversaw cultural heritage. We took it upon ourselves, instead, to think more collaboratively about writing a convention, by partnering with several host institutions, and by inviting as wide a range of experts as possible, to help co-author the document.

What transpired was a series of five roundtables with five host institutions – the Smithsonian, the Hermitage, Louvre Abu Dhabi, the Palace Museum and the V&A – held in Washington, St Petersburg, Abu Dhabi, Beijing and London, where we would attempt to write successive iterations of the new document. In addition, the project was launched at UNESCO headquarters in Paris in May 2017, where an initial conversation was had to discuss the fundamental question of what such a document should try to achieve. In actuality, we know very little about the effectiveness of the 1867 Convention, nor what kind of actions it might have prompted. Plaster production and trade was already well underway in 1867 and would eventually decline at the beginning of the twentieth century. In all likelihood, the document was most important as a reflection of an ambition, rather than something that effected massive change. So understanding what kind of

agency we were seeking to have with the updated convention was crucial. We decided that the new document should both reflect an ambition for more open production and sharing of reproductions, but also lay out guidelines for sound principles of how such an ambition should be approached.

At each roundtable, experts from across the region were invited to speak about specific areas of digital reproduction they were currently wrestling with, in order to inform the contents of the new document. Individuals as well as institutions, start-ups as well as public organizations, scholars, lawyers, curators, digital experts, conservators and educators took part. At the end of each roundtable, a special session was convened with a smaller group to work through iterations of the new document. These sessions were often hotly debated, while remaining constructive. Through repetitive drafting, the group was able to gradually find consensus and mutual understanding as to what the document should achieve and what it should contain. The final version of the document, called the ReACH Declaration, was unveiled at a special forum held at the V&A in December 2017, containing the signatures of the partnering institutions as well as several other collaborators. The goal now is to grow the list of signatories and to encourage ReACH-inspired projects in cultural institutions around the world.

This book serves to commemorate the ReACH Declaration, and you will find a separate copy of the document in the back flap of the publication. You are encouraged to share it with your network and become a signatory yourself. The book also serves to elucidate in more detail some of the bigger challenges ahead, while highlighting the best practices we encountered. Contributions here come almost exclusively from practitioners who participated in the ReACH roundtables, and the discussion has been roughly divided into what we see as four main opportunities and challenges behind digital reproductions: how we make them, store them, share them and use them. The book is also a live experiment in using open-access imagery. Throughout the book, we have scoured open-access collections from around the world, juxtaposing imagery from these collections with quotes from the texts. It's an exercise in free association, and just one more example of what you can do with digital reproductions.

In writing about copies, it's useful to recall the famous short story by Jorge Luis Borges, 'On Exactitude in Science'. In it, Borges depicts an empire obsessed with the recording of its own territory through cartography. Eventually the maps grow in size and detail, until one day an exact one-to-one map is constructed, covering the entire empire. The inherent folly of the endeavour was sensed by passing generations, and it eventually withered and decayed into the landscape. One wonders if, with the world of digital copies, we too are creating a kind of

one-to-one map, an overlay of digital objects, so vast that it might one day become ungainly and unusable, only to wither in the digital landscape in the near future. Borges' story is a useful reminder that <u>the impulse to record should never outweigh asking the fundamental questions of why and how</u>. This is precisely what we hope to achieve with ReACH and this publication.

# MAKE

The history of cultural production is also a history of making copies. Copies have served to transmit knowledge and inspire new creation for millennia. In the nineteenth century, the production of copies was formalized by museums who commissioned and traded in reproductions, creating vast plaster cast courts to bring global culture to a local audience. Today, making copies has taken on new meaning and potential. 3D scans and high-resolution photography can not only be shared as never before, but they are also playing a crucial role in safeguarding against the destruction of cultural heritage. Intrepid professionals and volunteers alike, armed with both high- and low-tech equipment, are venturing out in the field to capture digital imagery of global heritage. In doing so, they are creating a parallel world of digitized monuments that exists on standby, should their originals degrade over time, ravaged by the multiple threats of violence, accident, urbanization, tourism, natural disaster, and neglect.

Mari Lending

Page 44 '... reproductions testify to loss
and decontextualization'

Search 'decontextualization'

Result Vessel in the form of a duck
Peru, 1st–8th century

Source Minneapolis Institute of Art
online collections

Diane Zorich

Page 70 'In the last four years, we've digitized more than the previous four decades at the Smithsonian.'

Search 'four years, four decades'

Result Pieter Jansz Saenredam, Cathedral of Saint John at 's-Hertogenbosch, 1646

Source The National Gallery of Art, Smithsonian, online collections



Mari Lending

Page 42 'In encouraging the serialization of monuments and envisioning an international flow of reproductions, the Convention looked to the future as well as to the past.'

Search 'serialization'

Result Centrepiece bowl, Dagobert Peche, Wiener Werkstätte, c.1920

Source Minneapolis Institute of Art online collections

Adam Lowe

'The evidence of the past is always seen through the filter of previous generations.'

Search          'evidence, past, filter'

Result          Coffee percolator
                Italy, c.1950s

Source          Museums Victoria online collections

Adam Lowe

'Preservation needs to embrace the "career of objects".'

Search          'career of objects'

Result          Garden sprinkler attachment in the shape
                of a snail, 1990

Source          Museums Victoria online collections

Diane Zorich

Page 75 'To make a unilateral decision to scan at the highest resolution possible, in a collection of our scale, would impose astronomical storage and processing demands ...'

Search       'a unilateral decision'

Result       Design for a wall of a music room
             Italy, 18th century

Source       The National Gallery of Art,
             Smithsonian, online collections

Laura Jones

Page 85    '... in the future, the focus will be more on democratizing heritage conservation through the support of intangible heritage preservation.'

Search      'intangible'

Result      *Landscape with Double Rainbow*
John Constable, 1812

Source      V&A online collections
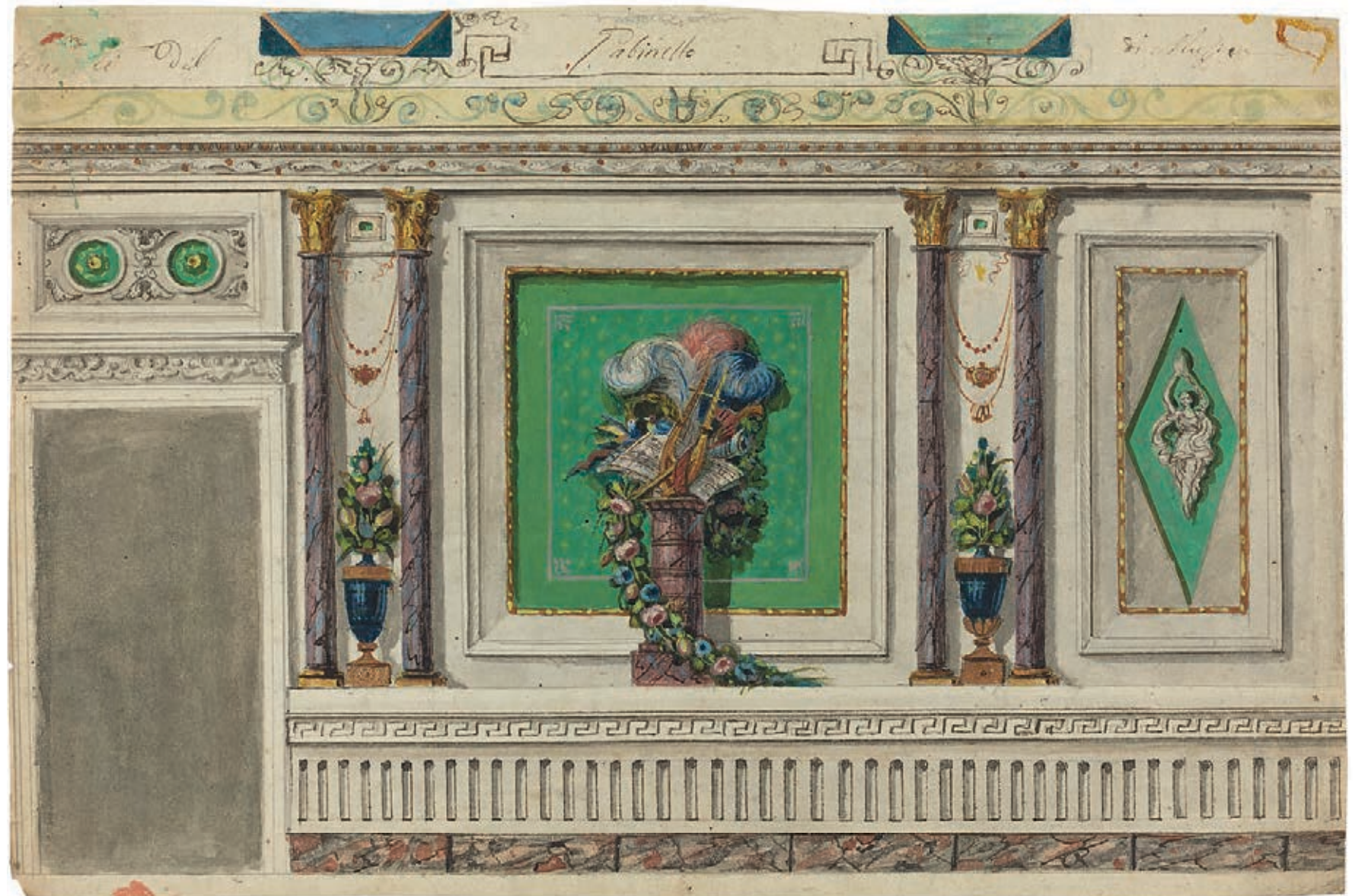


Vernon Rapley

Page 82    '... allowing for the organic growth of culture means we need to engage the community and what purpose it has for them.'

Search      'organic growth'

Result      Vase
Christopher Dresser, 1892-5

Source      V&A online collections

# Preserved in Plaster

# Mari Lending

What can a document do for an object? When the '1867 Convention for Promoting Universally Reproductions of Works of Art' was published, it helped set in motion the unprecedented production and circulation of plaster cast copies around the world. Here, Mari Lending traces the trajectory of one such set of objects, a series of casts from Norwegian stave church portals, most of them made as the churches were demolished. While the ornamented pieces were salvaged for Norwegian museums, their plaster replicas started travelling the world. Tracing the story of these casts, she explores the unfolding dynamic relationship between a fragile original and its reproduction, and what happens when copies are let loose on the world.

Henry Cole's visionary 1867 Convention theorized plaster monuments as a mass medium for the dissemination of architecture on an unprecedented scale. Intended for immediate action, his document was global in scope, practical, procedural and succinct. In encouraging the serialization of monuments and envisioning an international flow of reproductions, the Convention looked to the future as well as to the past. Importantly, the document consolidated national pasts by recommending that each country select its most venerable 'historical monuments' to be duplicated. This idea of codifying historical structures with an eye to potential reproductions highlights the reciprocity between canonization and mediation. The Convention recommended that national commissions were formed to establish procedures to exchange desired objects between museums, and members were advised to correspond closely to 'take advantage of the labours of other Countries at a moderate cost.'

Stave churches – medieval wooden buildings unique to Norway – were some of the earliest examples of architecture to be cast under the Convention, sparking further reproductions in plaster across the world. In the nineteenth century, these fragile structures were rapidly being lost, either through decay or demolition, and were prime candidates for casting. Examining the way Norwegian stave church portals were cast, circulated, displayed and described gives an insight into how the Convention impacted the contemporary canonization of monuments, creating new works, new modes of display and disrupting conventional taxonomies. This essay looks at four specific examples.

THE FLÅ, SAULAND AND ÅL PORTAL CASTS

Prince Oscar of Sweden and Norway (later King Oscar II) was one of the Convention's fifteen signatories. A patron of the arts, Oscar II founded one of the world's first open-air museums outside Christiania (now Oslo), where in 1881 the twelfth-century stave church Gol was re-erected. At the 'Histoire du Travail' section of the 1867 Exposition universelle in Paris, Norway exhibited the portals from the stave churches Flå and Sauland, demolished in 1854 and 1860 respectively. Henry Cole seized the opportunity, brought the two wooden artefacts to London after the exhibition closed, and had them replicated by the prominent plaster caster Domenico Brucciani, who made three copies of each.[1]

Cole's decisive action with the Flå and Sauland portals formed part of a wider European interest in stave churches which had been building for several decades. Circulation was essential in the process of inventing, reframing and canonizing the stave churches within an early cult of monuments. As their physical reality dwindled, their historical importance increased. A watershed moment in this process of designating the small medieval structures as monuments was when the Norwegian landscape painter J.C. Dahl – professor at the Art Academy in Dresden and principal in orchestrating the discourse on early Norwegian national monuments from abroad – had three stave churches measured, drawn and published in the elaborate folio *Denkmale einer sehr ausgebildeten Holzbaukunst aus den frühesten Jahrhunderten in den inneren Landschaften Norwegens* (Dresden, 1837). An emerging awareness of the rapidly disappearing churches was instrumental in a group of architects and artists (including Dahl) founding the Society for the Preservation of Norwegian Ancient Monuments in 1844. Both the folio and the society instigated actual monument conservation. However, the rescue operations were often efforts to save the monuments not from demolition, but from oblivion. The idea that paper lasts longer than wood or stone, and that preservation relied on mediation, was reinforced by the creation of plaster versions of the most characteristic parts of the vanishing buildings. In the next four decades, the portals became national, historical monuments in international circuits, fulfilling the dynamic laid out in Cole's Convention.

However, even before the stave church portals that eventually travelled the world had been cast, the reciprocity of paper and plaster was in play. In the 1854 guidebook to the Byzantine court – one of 10 architecture courts – at the Crystal Palace at Sydenham, the portal from the Norwegian eleventh-century church of Urnes was featured, more than 50 years before it appeared in the international cast market. Walking the visitor through the three-dimensional compilation of architectural fragments from Constantinople, Venice and Naples to Great Britain and Scandinavia, the guidebook's author, Matthew Digby Wyatt, elucidated a North Sea culture 'remarkable for its sense of the graceful and the grotesque'. Some of the finest examples of 'the Irish school of ornament' were to be found in the 'very interesting wooden churches of Norway', and particularly at the church of Urnes in the west coast fjords. J. C. Dahl's 1837 *Denkmale* was his source, from which one of the jambs from the north portal was reproduced in the handbook.[2] Thus Dahl's folio was already starting to build a canon of stave churches which would justify their later casting and preservation – by means of reproduction.

Yet it was the display of Brucciani's Flå and Sauland portals at the South Kensington Museum that marked the typology's physical inscription into global patrimony, as well as into the contemporary exhibition mania where visitors 'could choose among, or combine, multiple versions of the past.'[3] An early stereoscopic photograph depicts the Flå portal awkwardly propped against a protruding wall, casually placed between the two-horse chariot from the Vatican

and Pisano's pulpit from the cathedral in Pisa. When the Architectural Courts were later rearranged, the portal's context was perhaps more obvious in the North European and Spanish Court. Mounted side by side with the Ål portal – produced in Christiania when the church was torn down in 1880 and donated in 1882 to the South Kensington Museum by the Royal Frederik's University in Christiania – Brucciani's Flå edition found new surroundings among Gothic and Romanesque specimens. In 1907 the Urnes portal was acquired as well, and while Brucciani's Sauland production has been lost in the course of time, the portals from Flå, Ål and Urnes are still today the closest neighbours to Trajan's Column in the Weston Cast Court at the V&A, evincing the unexpected poetic effects of accidental taxonomical collapses. Although cast courts on both sides of the Atlantic often involuntarily demonstrated that architecture might behave in as unruly fashion in the galleries as it does outside curatorial control, the geographical and stylistic attributes of the Norwegian plasters served specific purposes. In the Musée de sculpture comparée in Paris, the Norwegian portals were placed at the entrance of the Romanesque galleries in a display that emphasized style and evolution, and helped contextualize the advancement in French medieval architecture by exhibiting relational affinities, resemblances and influences.[4] At the Musée du Cinquantenaire in Brussels, the Flå and Sauland portals were displayed as gothic works in the 'Art roman' section, as part of a panoramic showcase of a 'Histoire générale de l'art monumental'.[5] For the grand opening of the architecture galleries at the Metropolitan Museum of Art in New York in November 1889, the Flå and Ål portals were placed in the section dedicated to Norman, Romanesque and Byzantine architecture. This Flå portal was not from Brucciani's 1867 series, but a more recent edition. These fragments of Norwegian patrimony that crossed the Atlantic were produced by the Guidotti brothers in Christiania, and commissioned by the Historical Museum that still possesses the originals.

THE URNES PORTAL CAST

In 1907, a new portal casting operation took place in Norway, much in the spirit of the 1867 Convention. Prior to the endeavour, Haakon Shetelig, an archaeologist and the Director of the Bergen Museum, had written to institutions from St Petersburg to New York for potential buyers. While both the salvaged portals and the reproductions testify to loss and decontextualization, the referent of this fourth plaster and final portal to be cast is still at the church, at Urnes, in the Luster fjord on the Norwegian west coast. Officially, the church that was inscribed on UNESCO's World Heritage List in 1979 dates back to 1130. The question of origins and display, however, unfolds in exhilarating ways through the Urnes portal

and its plaster reproductions. In his invitation to museums in Europe and America to subscribe for casts – for £25.10s, packing and shipping not included – Shetelig argued that the fragments were unique remains of a lost group of hundreds of eleventh-century stave churches. In the end, he authorized eight casts of five pieces: the door with doorway, two pilasters, and a corner column, and had the 1,500-kilo cargo shipped to Christiania, Berlin, Brussels, Paris, London, New York and Dublin, keeping one set for the museum in Bergen.[6] Thus, prior to the 1909 publication of his book on the 'Urnes Style', Shetelig promoted casts of 'the oldest sculptural parts of the church', explaining that examinations had proven that the older parts had been moved and reinstalled on the north wall of the church: 'Specimens of this style are nowhere else present in such a large size or by such an excellent work, and the carvings of which we intend to make a cast are consequently of the greatest archaeological and historic importance.'[7] Yet, employed as spolia, the former west portal had been substantially cropped – or mutilated, as Shetelig wrote to Reginald Smith, the keeper of British and medieval antiquities at the British Museum – to fit into the lower north side-wall of the new church.[8] Accordingly, cutting edge research on the original church in situ travelled with the casts and was imprinted in museum inventories and catalogues on both sides of the Atlantic: 'Built into the north side of the wooden church of Urnes in western Norway', says the V&A Urnes entry, while the Metropolitan Museum's 1908 catalogue states: 'DETAILS, of carved wood, built into the wall of the timber church (Stavkirke), and said to be from an older building, previous to the eleventh century.'[9] Successfully, the cast market was used to disseminate the theory of recycled fragments that already had a history of exhibition, in the re-use of the 1070 church parts on the new 1130 structure, in situ.

The Metropolitan Museum's stave church portals testified to the successful realization of Henry Cole's dream of infinite expansion within the world of plaster monuments. It was in the course of the refinement of a collection conceived as an 'organic whole', and thus one in need of constant updating, that the Urnes portal was purchased by the Metropolitan in 1907. In London, the portals became part of an emerging global collection of architecture; in Paris, they were embedded within a rigorous style-based historical scheme; in Brussels, they formed part of a panorama of monumental art. But these replicated monuments were not only moving between distinctive and transitory totalities; they also took on individuality as they moved around. While the Metropolitan's portals purchased in the 1880s were treated to look like ancient tar, they preferred to have the Urnes ensemble 'in the color of the plaster, not painted in imitation of the old wood', perhaps inspired by the Trocadéro's ideal of uniform colour to facilitate stylistic comparison in a way that neither original works nor patinated reproductions allowed for.[10] The left jamb of the Urnes portal still in storage in Paris – it made a guest appearance in

the galleries in winter 2017 – is encrusted in a light brown colour that was applied at the atelier de moulage at the Trocadéro. Shetelig's offer to have the surfaces prepared 'in the dark colour of the wood' was turned down by the V&A as well, who instead requested a sample in plaster 'painted so as to show the general tone of the colour of the original', electing to have the finishing done in London.[11] The surfaces of the casts that travelled to Christiania were prepared in Bergen: 'The colour might appear very dark; it is, however, similar to the original.'[12] Thus we observe the full spectrum: the resurrected pale, corpse-like Metropolitan Urnes portal that was excavated from storage in 1990 and relocated to Copenhagen; the almost black version in the V&A; the light-brown surface of the Paris edition; and the coated Christiania and Bergen versions, prepared by a *formatore* at the Bergen Museum – each copy singular despite their shared origin.

The history of monuments is one of destruction, disappearance and invention. It is by curatorial intervention, in situ and in galleries, that they allow us to imagine history as a continuous space. Yet the canonization of monuments most often happened off-site. In the case of the stave churches, the physical objects were reassessed and revalued as they were about to vanish. Having once been obsolete buildings in the Norwegian provinces, of hardly any interest to the local congregations who wanted and needed bigger, better-lit and more practical churches, they became monuments through physical loss and they survived as mediations. Thought to be immovable and durable, architecture and architectural heritage are shaped 'where buildings in both a real and imaginary sense are collected and displayed.'[13]

When in 1845 the Society for the Preservation of Norwegian Ancient Monuments asserted that there are 'numerous antique monuments which cannot be dragged into museums – great architectural works whose meaning is so profoundly interwoven with the place where they were erected that removing them will cause serious loss', the claim is, in one sense, self-evidently true.[14] Yet rather than becoming incomprehensible in their manifold dislocations, the serialized plaster monuments took on new significance while documenting and intensifying the significance of their referents – those lost, ruined or extant buildings. When offering the set of Urnes casts to museums around the world, Haakon Shetelig referred to the reproductions as documents, and to the initiative as an act of preservation: 'Our reason to make the cast is to preserve this valuable document, if the original by any accident should be lost.'[15] This conflation of documents and monuments was time-typical. The portals pointed to their place of origin, while canonizing the churches among monuments from across time and place. As portable full-scale documents, in three dimensions, they were circulated and preserved in plaster.

## THE DECLINE OF CASTING

Henry Cole's will-to-circulation sparked a proliferation of new plaster monuments. Yet his optimistic belief that the casting process would not cause damage to the originals was soon disputed. Acknowledging how moulding injured the colours and patina of artefacts, many museums banned the making of new casts from their treasures. When setting up the Hall of Architecture at the Carnegie Institute in Pittsburgh, the Director asked the Historical Museum in Christiania for the same edition of the Ål portal that was in the Metropolitan collection.[16] However, the archaeologist Gabriel Gustafson of the Department of Nordic Antiquities told him that the cast was sold out, and the making of new moulds was out of the question, 'because the door has suffered by earlier copies.'[17] Countering Cole's vision of a global museum of reproductions manufactured without causing 'the slightest damage to the originals', Gustafson explained that 'in general we take no such copies anymore, because the old wooden things are suffering thereby.'[18] Yet he could offer a fine exemplar of the six-metre tall Sauland portal, still in stock, and one of 'our best, greatest, most complete and most characteristic doorways'. This version was made by Josef (Giuseppe) Carpanini, another Italian émigré *formatore* working in Oslo: 'This copy in gypsum uncolored you can get for the price of 95 dollars incl. packing, freight and assurance delivered in New York.'[19] Patinated in Pittsburgh in a much lighter brown shade than both the wooden original and Brucciani's 1867 edition, this Sauland portal is still on display the Hall of Architecture in Pittsburgh.

Cole's Convention marks a key moment in the translation of national monuments into portable global patrimony. When nations in the nineteenth century catalogued their heritage, canonization became both invention and reinvention. Detached from their place of origin, architectural structures were made into movable representations of a national past. The plaster monuments testified not only to documentation and reproduction but to production and invention, something to which the casting of the Norwegian stave church portal and their international orbit of exhibition testify. With an eye to contemporary facsimiles made by new non-contact technologies, we see that plaster was a medium in which ideas of pristine states, the unique, the authentic, the irreplaceable and the site-specific were extensively theorized and historicized.

01



02

01
Photograph of a plaster cast of a carved doorway from the Ål church, Norway at the South Kensington Museum, 1896.

02
Detail of doorway from Ål church in Hallingdal after a plaster cast in the South Kensington Museum, Hjørdis Grøntoft Raknerud, 1898.

03
Photograph depicting an exterior view of the Gol stave church, Norway, c.1885.



03

# Changing Attitudes to Preservation and Non-Contact Recording

# Adam Lowe

New technologies are changing the way we think about preservation. As cultural heritage sites gradually degrade – partially from the destructive consequences of their own popularity – digital recordings and physical replicas are emerging as a solution to long-term preservation. Adam Lowe, founder of Factum Arte, details his studio's work in safeguarding through copying, and lays out a plan to build a network of experts and community organizers to scan and digitally preserve cultural monuments around the world.

'Time, fire and water are of course bad for any painting's health. But the sad fact is that two groups of people have done more damage to paintings than anything else: those who sell art and those charged with looking after it.'[1]

Articulate objects allow us access to the actions and thoughts of past generations. Mass tourism, war, vandalism, instability, political apathy, climate change, natural disasters, theft, and iconoclastic attacks not only challenge their preservation but threaten their very existence as meaningful evidence.

New technologies permit highly accurate condition monitoring that can help the conservation community manage the changes brought about by a world population of over seven billion people. Preservation has always been a complex task that reflects the values of the time and geographic location. The evidence of the past is always seen through the filter of previous generations, and their actions condition our understanding in a way that will, in turn, shape the response of future generations. Education and applied technology were driving motivations at the time the V&A was established following the Great Exhibition in London in 1851. The relationship between technology and craftsmanship, aesthetic appreciation and content, originality and authenticity were being redefined by a generation of great scholars.

When Henry Cole wrote his 'Convention for Promoting Universally Reproductions of Works of Art' in 1867 he was in London, the capital city of a vast colonial empire that was undergoing an industrial and financial revolution. The role of museums and museum display was being changed by the arrival of new methods of recording and manufacture; electro-forming, photography (with a vast range of photo-mechanical printing techniques) and new methods for moulding and casting were the emerging technologies. Contrary to his assertion in the first paragraph of the Convention that these technologies were 'harmless', moulding techniques caused extensive damage to many fragile objects.

Our challenge at the start of the twenty-first century is to apply digital recording and output technologies in a way that will be inclusive and enlightened. The Internet has redefined the notion of access and now reaches a global community. It can be used to generate 'fake news', but it can also be a medium that can help preserve the planet and provide unfiltered access to the evidence of its past, both human and natural.

Preservation needs to embrace the 'career of objects' and follow principles based on the fact that everything is continually changing, especially our perceptions and understanding. Ageing is a process that can happen at a natural pace; or it can be accelerated by external events.

A CASE STUDY: THE TOMB OF SETI I

As diverse forms of documentation become more accurate and objective, and computational power increases exponentially, it becomes possible to analyse and understand these. For example, after discovering the most important tomb in the Valley of the Kings, that of Seti I, Giovanni Battista Belzoni recorded the interior from 1817 to 1820 in watercolour. His written accounts and detailed paintings reveal the pristine condition of the tomb at the time of its discovery two hundred years ago. Harry Burton's black-and-white photographs from the 1920s tell a very different story; Factum Foundation's 3D and composite colour recordings made in 2016 document the tomb's current state. The different techniques used to recover and relocate sections of it since its discovery have been less than benign and have altered the tomb's appearance dramatically.

Most of the changes that have altered the appearance of the tomb between 1817 and the present were done in the name of preservation. The great Egyptologist Jean-François Champollion was proud of having removed a large section of the tomb and taken it to Paris where it now hangs, in a heavily restored state, in the Musée du Louvre. In a letter to Joseph Bonomi, he writes: 'Rest assured, Sir, that one day you will have the pleasure of seeing some of the beautiful bas-reliefs of the tomb of Osirei in the French Museum. That will be the only way of saving them from imminent destruction and in carrying out this project I shall be acting as a real lover of antiquity, since I shall be taking them away only to preserve and not to sell.'[2]

During the nineteenth century, tourists started arriving at the Valley of the Kings. The casting of the carved and painted surface continued in parallel with the hacking out and removal of sections of the walls. At the beginning of the twentieth century, the industrialist Sir Robert Mond was shocked by the condition of the tomb and financed Howard Carter to stabilize the structure by building brick pillars, adding structural supports and installing electricity. While this helped protect the fabric of the tomb, it again changed its nature and appearance.

Mass tourism presents even greater challenges. At the height of the tourist boom before the 2011 revolution, thousands of people wanted access to the tombs of the Theban Necropolis every day. Air-conditioning and glass panels started appearing inside the tombs as a means of 'stabilizing' the environment and protecting against damage. The infrastructure to support large numbers of visitors presented additional problems. In the 1980s, the removal of the visitor centre that had been built above the vast sarcophagus room caused a large section of the celestial ceiling in Seti's tomb to collapse and as a result the

tomb was closed to the public in the mid-1980s. In the late 1990s, the American Research Centre in Egypt undertook a conservation study and carried out some restoration and consolidation tests. These clearly demonstrated the problems of making remedial repairs with acrylic resins and contemporary paints.

In 2001, Factum Arte carried out the first high-resolution, non-contact 3D scanning in the tomb of Seti I. One hundred million independently measured spatial points per square metre were recorded using a laser scanning system. 3D data was coupled with composite photography to produce colour data that is both accurate and can be enlarged many times without loss of detail.

In 2009, Factum Foundation, the not-for-profit sister organization of Factum Arte, teamed up with the University of Basel to form the Theban Necropolis Preservation Initiative (TNPI). TNPI is committed to ensuring that the sites on the West Bank of the Nile in Luxor are recorded at high resolution using advanced non-contact technologies in projects that involve local people at every level. The project has already yielded practical results. A facsimile of the burial chamber of Tutankhamun was installed at the entrance to the Valley of the Kings and is now part of the Carter House Visitor Centre. Stoppelaëre's House, a domed mud-brick building at the entrance to the Valley of the Kings, designed by the great twentieth-century Egyptian architect Hassan Fathy, was restored by the Tarek Waly Centre for Architecture and Heritage. This building will house TNPI's 3D scanning, archiving and training centre. It was opened in February 2017 by the Director General of UNESCO, Irina Bokova, the Minister of Antiquities of Egypt, Khaled El Enany, and the Swiss Ambassador, Markus Leitner. The initial equipment is already in Egypt and the first three Egyptian operators are working to establish the centre as a fully operational example of the application of recording technologies. The centre will contribute to the long-term survival of the tombs through condition monitoring, and will assist heritage managers in the complex task of preserving the Theban Necropolis in the twenty-first century. Its existence will ensure that any future documentation can be carried out locally and for the benefit of the community.

The complete recording and rematerialization of the tomb of Seti I, and all the fragments removed from it since its discovery in 1817, is an important part of TNPI. The aim is to reveal the changes to the tomb since it was discovered 200 years ago and to present a facsimile on a site next to Stoppelaëre's House. With the potential to integrate fragments housed in museums around the world, as well as those uncovered by excavations carried out by the University of Basel from 1998 to 2005, the facsimile will be more complete than the original tomb in its current state – its narrative, meaning and importance made accessible to all.

The exhibition *Scanning Seti: The Regeneration of a Pharaonic Tomb* at the Antikenmuseum in Basel, which opened on 29 October 2017, is the first phase in the creation of the facsimile of the tomb of Seti I. A combination of original and facsimile objects, including an exact copy of two chambers, reveal and explain the importance of the tomb, the texts it contains and the role of documentation in preserving this site for future generations.

The final and most ambitious phase of TNPI involves the building of workshops that will train and employ local artisans to manufacture high-resolution facsimiles of the tomb of Seti I and others. The workshops will be practical, but will also serve as a visitor centre in which the public can learn about non-contact approaches to conservation, and about the exciting technical innovations that go into documenting cultural heritage, facsimile fabrication, condition monitoring and assisting in the ongoing research into how to stabilize the condition of the tombs that were built to last for eternity – but not to be visited. TNPI has been financed by Factum Foundation and has received no public funding. It demonstrates how technology can be applied in practice and suggests how, with the support of visitors, it could ultimately be self-financing.

THE CULTURAL PRESERVATION NETWORK

In addition to the work in the tomb of Seti I, Factum Foundation is working on the launch of the Cultural Preservation Network: a recording initiative and digital archive for collecting, preserving and disseminating cultural heritage in its many forms and at different scales. This project is actively working in Europe, but is currently being focused on cultural heritage sites in areas where the risk is most acute. The Middle East and North Africa are areas that are either under direct threat or suffering indirectly from the side-effects of conflict in the region, but sites in Chad, Nigeria, Daghestan and Brazil that are threatened in different ways are also being recorded and communicated.

The unique sites, buildings and artefacts that reflect the complex history of diverse parts of the world will be recorded by a network of local specialists trained in non-contact 3D digital and colour recording technologies using an approach designed for social and economic sustainability and exponential growth. Factum Foundation has established relationships with respected, reliable and invested local partners.[3] They will be responsible for managing the regional bases from which they will lead training activities, administer resources and coordinate projects. The initiative is based on transferring a

set of core skills, supplying equipment and software for archiving and data processing and providing ongoing support.

The goal is to gather a vast amount of digital data that can be used to attract interest from a global community of Internet users. This interest will be used to promote a new approach to the preservation of original objects whilst creating a generation of informed cultural tourists who understand the complex relationship between originality and authenticity, preservation and alteration.

The value of cultural artefacts does not lie in their short-term financial worth as commodities, or in their fame, which can attract visitors to remote locations, but rather in their ability to communicate their meaning across time and religious divides. Conflict zones repel cultural tourism, but each of the countries identified has the capacity to generate a significant income stream for the local community if its cultural monuments are recorded and communicated in a way that ensures their protection and survival.

The network is centred on providing the local community (with an emphasis on youth, and regardless of gender or faith) with the necessary equipment and skills for high-resolution digital recording of cultural sites. The primary focus is on high-resolution photogrammetry and composite photography, data storage, archiving and data processing. It will also teach rematerialization techniques, digital restoration and various applications for facsimiles. These useful and transferable skills will greatly benefit local communities and regions afflicted with youth unemployment and radicalization.

It is essential that all trainees understand how to relate to, and work within, a fragile environment. To this end, training will be given in maintaining and repairing equipment and in working within sensitive environments with fragile objects without putting either at risk. The training will also provide a basic understanding of conservation theory and methodology. These skills and technologies will not only help protect local heritage, but will add a new dynamism to the cultural industries.

WHAT DOES 'HIGH RESOLUTION' MEAN?

3D scanning and composite photography are changing the ways in which cultural heritage is recorded, but the technologies are unfamiliar to most involved in heritage management. Moreover, misinformation is resulting in wasted opportunities. There is a need for commonly accepted definitions of terms.

The best definition of high-resolution data is that which allows the object to be rematerialized so that the physical copy is a replica of the original object in terms of colour, surface, shape, and size. Resolution is of critical importance in rematerialization, but equally necessary for the intelligent computer vision software that is being developed to analyse and interpret digital archives.

A simple example can help to illustrate misunderstandings that exist around the term 'high resolution': Between 2011 and 2013 Factum Arte recorded the carvings by Jacopo della Quercia, Amico Aspertini and others that adorn the facade of the Basilica of San Petronio in Bologna. Different recording systems were used to capture different aspects of the carvings. The whole facade was recorded from Piazza Maggiore using a FARO Focus 3DX 330 scanner (LiDAR scanner), while white-light scanning with the Nub 3D Sidio recorded the surface of each sculpture from scaffolding that covered the facade during cleaning and restoration work. Both are often referred to as 'high-resolution' scanning systems, yet they yield dramatically different results.

LiDAR technology is mainly used for large-scale scans, such as topographic mapping, architectural recording and visualizations. The Nub 3D white light scanner, on the other hand, was developed for precise surface inspection. When the resulting 3D files from each system are rematerialized at actual size


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using precision CNC milling, the difference in the resolution of the recorded information is clear. The resolution of LiDAR scans can be misinterpreted when viewed on screen, as they are often mapped over with photographic data, producing more visual detail than they actually have. The difference between the two scanning techniques is obvious, but the comparison is not entirely fair: the recording distance was not constant. LiDAR systems are good for recording large objects like buildings or terrains, but less good for recording surfaces.


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A direct comparison between 3D files recorded with the Faro Focus 3DX 330, working at its maximum resolution at its minimum distance from the object (between 60 cm and 1 metre), and the same surface recorded with the Lucida Laser Scanner (designed and programmed by Manuel Franquelo with the team at Factum Arte) at its normal working distance of about 10 cm from the surface, clearly shows the different capacities of each system.

In all recording, the relationship between information (what you are trying to record) and 'noise' (interference resulting from the limitations of the recording system as information is transformed from one state to another) is critically

important. The aim of high-resolution recording is to 'capture' an object so that the data has the closest possible correspondence to the original in terms of shape, surface and colour.

A CAST COURT FOR THE TWENTY-FIRST CENTURY

Digital recording technologies are leading to a deeper understanding of works of art. Artworks, the repositories of evidence that reveal the many subtle decisions taken during thei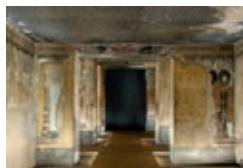r creation, can now be studied with forensic accuracy. Conservation is the management of change and the evidence uncovered by new recording technologies can help to identify changes that have happened over time, revealing how and why things have aged. Using these methods, we acquire the ability to read both original intention and the values of those who have 'looked after' the cultural object. This facilitates a detailed analysis of the interventions that have been made for different reasons at different times and in different places. The use of technology produces facts, not opinions, and is leading to new insights and discoveries.

This approach is creating a new type of connoisseurship, one which can unlock the complex history of an object, allowing it to be read and engaged with in new ways. The recording work carried out by Factum Arte's team in 2009 in the Tomb of Tutankhamun has proved to be a turning point in documenting and preserving the past through the application of new technologies. It has led to speculation about the existence of new chambers and it will be critical to monitor change to the walls of the burial chamber.

The work that is being done in the tomb of Seti I will set new standards and result in the transfer of skills and technologies to a local team. This approach is also being applied in other places affected by conflict, economic hardship, natural disasters and neglect, with the Middle East and North Africa an obvious focus of attention. The historical importance of the region and ongoing conflicts make it exceptionally vulnerable. The documentation of cultural heritage is now as important as ever. It is vital that recordings contain sufficient information to act as an accurate record in the case of damage or destruction, rather than as souvenirs or memories of things irretrievably lost.

Pages 64–5     The key to the successful recording of cultural heritage lies in the transfer of skills and technologies to local communities; the provision of training and support; the development of a distributed archiving system and

ensuring the data is shared, disseminated and used. Once universal guidelines for digital documentation are established, the role of both visualisations and physical facsimiles will become the central topic. The Cast Courts at the V&A are evidence of the nineteenth-century desire to use technology to protect and replicate. What will the cast courts of the twenty-first century look like?

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01
CNC-milled data from a FARO Focus 3DX 330 LiDAR scanner (left image) and the same section of the facade of the Basilica of San Petronio recorded with a Nub3DWhite Light scanner (right image). Both are milled at actual size.



Medium Range Scanning System, Laser Scanner Faro Focus 3d
Jacopo della Quercia, Church San Petronio, Bologna
Recorded from Piazza Maggiore

Close Range Scanning System, Nub 3d Sidio Scanner
Jacopo della Quercia, Church San Petronio, Bologna
Recorded from Scaffolding

02
Maximum resolution recorded with the Faro scanner working at its minimum distance (left image) and the same section of the tomb of Seti I recorded with a Lucida scanner under normal working conditions (right image).



Faro Focus 3d X130 used at close range at maximum resolution
Tomb of Seti I (detail)
Recorded from 1.4 meters

Lucida Laser Scanner used at close range at normal working resolution.
Tomb of Seti I (detail)
Recorded from 0.1 meters

02

04

03
Aliaa Ismail and Moussa
Sayd Mohamed recording
in the pillared part of the
Sarcophagus Room (Room J)
in the Tomb of Seti I, 2016.

04
The facsimile of the
Hall of Beauties
looking towards the
Sarcophagus room. This
facsimile is based on 3D
scans and composite
photographs made by
Factum Foundation in
2016, installed at the
Antikenmuseum,
Basel in 2017.

05
The facsimile of the
sarcophagus of Seti I
made from
photogrammetric
data recorded in Sir
John Soane's Museum
rematerialized
using Océ elevated
printing technology
by Factum Arte.





03                    05

# Scanning on an Industrial Scale

# An interview with Diane Zorich

The Smithsonian Institution has an unrivalled 155 million artefacts in its collection. While every museum is faced with the challenge of how to digitize their collection, the sheer size of the Smithsonian's holdings means that they have to think on an industrial scale. Diane Zorich, Director of the Smithsonian's Digitization Program Office, explains how they are creating new systems to tackle the challenge, and how 3D scanning poses new obstacles and opportunities.

**Brendan Cormier**

I thought we could start with you simply telling me about the genesis of the Digitization Program Office at the Smithsonian.

**Diane Zorich**

Sure. I was working as a contractor in the late 2000s when I was brought in to help a team of Smithsonian staff develop a strategy for increasing digitization across the institution. The chief information officer at the time had been trying to get the various museums, libraries and archives that comprise the collecting units at the Smithsonian to work more collaboratively on digitization. They had all been doing their own kinds of digitization in what we might now call a 'boutique-like' fashion, based on projects and individual priorities within their particular domain, but none of this was really moving the needle in terms of how much of the overall Smithsonian collection was being digitized. We currently have about 155 million objects and specimens. Back then it was 130 million. Still, it was a huge number, and nobody knew exactly how much had been digitized, or at what quality, and whether 'digitized' meant just a digital record, or an image, or both. So the first Digitization Fair at the Smithsonian was a way to bring the discussions to the table. One of the things that came out of that fair was a strategic plan that called for a centralized office across the Smithsonian that would address these issues, and that would be charged specifically with increasing quality and quantity of digitization.

That office, now called the Digitization Program Office, was charged with identifying ways to scale our digitization massively, so it's not just 1000 digitized objects here and 10,000 there, but 100,000, 500,000, even a million objects at one go, in an industrialized fashion. It was really a 'start-up' within the Smithsonian, a very unusual kind of development here. The Smithsonian is a very decentralized institution. Although everybody outside the Smithsonian sees us as one institution, inside the Smithsonian we talk about ourselves as 19 museums, nine research centres and a zoo.

The Smithsonian hired Günter Waibel, who is now at the California Digital Library, to power this thing up. He created three programmes at the time, based on the mandate that was given to the office. The first programme tried to identify what had already been digitized across the Smithsonian, which was a really difficult thing to do. A pan-institutional team was put together to identify what we had in terms of digital assets at the time, to derive a sort of baseline number, and then each museum, library, archive was asked what more they wanted to do each year to increase that number. They also were asked to tell us what their priorities were for digitization for every year. The Digitization Program Office continues to do this review every year, in a process called the Digitization Assessment. Initially, it was very difficult for our various museums, libraries and archives to pull together numbers for the assessment, but each year we get better and better with this

process. The second programme that was developed was the mass digitization programme. This was an effort to see if we could somehow bring industrialized processes and superior workflows to digitization so that we can get away from these small, boutique-like projects which were often referred to around the institution as 'random acts of digitization'.

We started this programme with a series of pilot projects to see what was involved in literally moving the digitization of objects through at a very fast pace without sacrificing quality. We started those projects on a number of different kinds and types of objects and specimens to better understand their different needs. We needed to know what those needs were and how we could make sure that we might digitally capture these different collections quickly, while still meeting those needs. We learned an awful lot from these pilot projects, mostly what the pain-points were in the process, and then we moved up to large-scale production projects once we worked out those pain-points. I have to say, what was involved in a lot of this was just determining what the workflows were. Things that might seem inconsequential, such as, 'How do I get objects from storage to the capture station and back to storage?' can be really complicated and add a lot of time to the process if it's not carefully thought out and orchestrated. That's the physical workflow.

In some ways, the digital image capture of the object is the least of the problems. We often say we try to get objects from shelf to the public in 24 hours. That's the goal. The reality is sometimes it's hard to do because we have a lot of systems that this data has to work through. We bring an object to the digitization station and from there it's captured. Then that image and its data, the record, have to go through individual collections' information systems, a digital asset management system, in some instances to research aggregators, or into the Smithsonian's own aggregated system known as Collections Search. So pushing it through the data pathway is another workflow. We call that our virtual workflow. So for our mass digitization projects, we have a physical workflow, the imaging workflow and the virtual workflow – those three components have to be lined up for each project to digitize at the scale we do.

A couple of years ago we started digitizing some of our flat objects on a conveyor belt system, which we're doing right now with our botany specimen sheets. This allows us to capture things very quickly; a specimen sheet is captured once every four seconds. That process is so automated that the specimen sheet is physically handled only when moving it out from storage to the conveyor, putting it on the conveyor and taking it off. Everything else is automated from the point of capture. The digital file is sent to the digital asset management system, to the museum's

collections information system and then out to, ideally, our public website and to various aggregators in the natural history research community.

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Our mass digitization processes have been pretty successful, so much so, that in the last four years, we've digitized more than the previous four decades at the Smithsonian. Our chief limitation right now is funding. If we had more funding, we could get more of these workflows going across the Smithsonian.

BC    With the conveyor belt system, how do you coordinate it so that each photographic record gets attached to the same digital record and its metadata? It seems that in those quantities, there's a risk of images and written records not lining up.

DZ    Well, this is really interesting. We're now using the conveyor system with a natural history collection. Natural history collections are often so large that they are catalogued by collection, not by individual specimen. But when we create an image and a record through our mass digitization processes, we are now creating a record for each specimen in the collection. So we can now, for the first time, establish a kind of item-level intellectual control that has not been possible in the past, because when you have several million specimens you can't usually record them individually – so you record them in a group. So we create what I would call a stub record for each specimen digitized, and we barcode at the point of digitization, so they get a unique number from our numbering system and that specimen image is forevermore associated with a specimen record. So that's part of the data workflow. We also have a transcription process associated with our botany collections digitization. Most of these specimen sheets have a label on them. The specimens themselves might be over 100 years old so labels are often handwritten, mostly by collectors or people who studied the specimen over the years and who added

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information to the label. These labels have to be transcribed, so we send them out to a transcription company associated with the owner of our conveyor system. This company transcribes at a rate that's usually about two weeks behind our imaging, so we get the data fairly quickly from them. It's reviewed in an automated fashion and then an individual also reviews a statistically significant sample of transcriptions. If there are errors in that sample the whole batch is rejected and goes back. So there is a very automated process for the transcription, and a very good quality control process for that as well.

We've had other collections in our culture, art and history museums where we haven't been able to do transcriptions of records or labels and we've instead had to rely on staff at units to try to keep up with the metadata, but this usually doesn't work. You need a devoted group to do this, and this is where things fall

behind. Nobody in our museums has the staff to handle this at scale. We are going to be hiring somebody very shortly who we're calling our informatics programme manager. Their job will be to identify ways we can help these other units keep up with records enrichment. They might do that by finding external transcription services to help them. Or they might help create automatic metadata generation using deep learning techniques, in which machines are able to learn from the data provided, to enrich data records.

BC    When did you start to get involved in 3D digitization?

DZ    That was our third programme that we launched around 2011/2012, because 3D digitization was starting to get more ubiquitous in cultural organisations. It had been prevalent in industry for a while already, but we didn't have experience with it. We had a few people who had been working with it in our exhibits office, and they joined the Digitization Programme Office to start experimenting with 3D technologies by scanning 20 iconic objects from our museums' collections. We chose these objects for a number of reasons. In some cases, it was their material composition. We wanted to figure out the challenge of 3D digitizing certain types of materials. It's hard to capture shiny things in 3D. It's hard to capture transparent things, or things with lots of spaces in them. So we had to experiment.

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We also wanted to identify museum use cases for 3D in education, conservation and the like, and wanted to win support for further work in this area, which is why we chose some of our most iconic objects like the Wright Flyer to be digitized in this manner. The Cosmic Buddha, from our Freer Sackler Gallery, was another really interesting challenge, which was brought to our attention by a curator who had the foresight to think that 3D might be able to reveal new research aspects for that sculpture.

BC    So you were you purposely choosing objects that could address the different possibilities that 3D could offer?

DZ    Yes, that was one factor. We wanted to see what are the conservation applications, what are the research applications, what are the educational applications. And then what are the logistical challenges of capturing and generating these large data sets and how do we handle that in a data management sense? So yes, there were lots of testing of use cases, if you will.

The Cosmological Buddha is interesting in that regard. It's an important sculpture that has been studied over the years, mostly by scholars taking rubbings of it, because it's so intricately carved in a low relief that it's hard for the eye to see all

the details of the scenes depicted. The rubbings themselves would darken the statue, making the reliefs even harder to see over the years. But by 3D digitizing it, we're able to change the light source and the light field reflections on it to highlight the reliefs. Now you can home in and focus on segments of that intricately carved Buddha sculpture to identify the actual scenes, and it's been revelatory.

So while it has enabled the curator and scholars to do further research on this sculpture, it's also enabled us to develop an educational component for the general public. If you've looked at this model in our 3D viewer, it's lined up now with hotspots where you can click and see a highlighted section of the Buddha. A curatorial 'tour' pops up that tells you what's going on in the highlighted section, scenes from the life of the Buddha, and what these scenes represent and what particular reliefs are, and who particular individuals are in the scene. Much of this is almost impossible to see with the naked eye right now.

BC     Yes, and were you were saying it's also now possible to unfold it or flatten it, so to speak?

DZ     Yes. That's probably one of the more 'ahh moments' of this particular educational component. You can virtually 'peel off the exterior' relief, so you can lay it flat as if it was almost a virtual rubbing, akin to a physical one. But with the 3D model in our viewer, you can also change the light source to highlight the carvings in it. The other thing to mention here is that the sculpture itself is life-size. So you would never be able to turn it upside down and look under its elbow, and things like that, which you can do with the 3D model.

BC     In your talk last summer, you also mentioned employing 3D imaging in a sort of archaeological salvage mission in the Atacama Desert. Could you talk a bit more about that?

DZ     A curator in our natural history museum, Nic Pyenson, who is a palaeontologist specialising in mammalian fossils, was called down to a site in the Atacama Desert where the remains of an interesting new whale species had been found. He went down and realized that this was an amazing site, but archaeologists were given only a month or two to excavate it because it lay in the middle of a planned highway that the government of Chile was about to build. Knowing they could never excavate the site in the short period of time available, this curator called our 3D team, and they went down there and scanned the site. They then were able to bring the data files back while the actual fossils were removed quickly and put into a museum in Chile.

Fossils excavated from archaeological sites are embedded in plaster casts to make sure that they stay intact during transport to a museum or storage facility. To study the fossil, the cast has to be chiselled away and prepared so that the specimen 'resurfaces'. This can take a while. In contrast, we were able to do the 3D capture of the fossils while they were in situ and give the data files to the curator for study. He, in turn, was able to determine from the fossils and the context of the site that the specimens were likely part of a mass dying event sometime in the past. There were more than 40 specimens, all of whom were intact, including juveniles of various ages, suggesting that the whales were likely a pod that died simultaneously. He and his colleagues were able to reconstruct that from the 3D data.

BC     You also mentioned in your talk several instances where you've worked with indigenous groups, scanning certain objects from the collection, in an act of digital repatriation. Can you talk more about that?

DZ     Yes. I can give one particular example. We have several atlatls, a type of spear-throwing device, in our collection, from indigenous groups in the Pacific North West. They're no longer used there, and the whole tradition of how they are used is uncertain, but indigenous groups expressed interest in getting a better sense of what these objects were and possibly re-introducing their use to their clans. We worked with a member of our repatriation department to 3D digitize a couple of these objects. He took the 3D copies out to the indigenous groups, and together they tried to figure out how they actually were used. This is an instance of 3D digitising culturally significant objects, with the permission of the communities from which they come, and with the intent of re-introducing traditions to those very communities at their request.

BC     And finally, in terms of the projects I want to discuss with you, you experimented with the scanning of the command module from the first moon landing. Can you tell me how that project started?

DZ     It's one of our more popular objects at our National Air and Space Museum, and it needed to be conserved. The Apollo 11 Command Module is usually covered in this plastic structure, so that people can lean against the plastic and peer in but not actually touch it. So that plastic had to all be taken off to conserve the Module in preparation for the 50th anniversary of the moon landing. This seemed like a perfect opportunity for us to 3D capture it.

But this was going to be a huge challenge for us. Fortunately, we found a corporate partner, Autodesk, who wanted to help us with this, because they saw it as a way

to drive innovation within their company while performing a public good. With an expert team from Autodesk, we scanned this object using every single capture technology available at the time. The issue then became compositing all these datasets, which was a huge challenge. It was terabytes of data. Autodesk had to create new software and computation algorithms to help make this possible. In the end the partnership was a win-win: Autodesk had this massively complex data set which pushed forward testing of their technologies and products, and we had an incredibly sophisticated 3D model of an iconic object from our collection.

BC  Let's talk about the challenges of scaling up 3D digitization. So far, you've been working through the challenges and merits of 3D digitization with several test cases. Do you see a day where 3D is scaled up in a similar spirit as your 2D capture? And what are the challenges if so?

DZ  It's difficult in a number of ways. One is financial. It's still a huge expense to 3D scan at the quality we need, whereas in our mass digitization program we brought the cost of digitally capturing a specimen, for example, down to about $1.50. 3D capture and processing is *much* more expensive. So there's that financial challenge. Of course, if you do this at a larger scale and you make it a more industrialized process, you would bring the costs down. But how much you would bring it down, no one knows yet.

The second issue is that these datasets are huge, and they're challenging our capabilities at managing and storing them. There is little-to-no metadata standard for 3D data and there are certainly no repositories yet that have been developed that adequately deal with these 3D datasets. So our team is working on this pretty steadily because if we want to scale up, we're going to have to tackle that challenge of how we deal with and sustain and deliver these datasets at scale.

We're bringing in all sorts of partners to help us address this challenge. The idea would be, in an ideal world, that we would do scaled-up high-resolution 3D scanning, and the data would go to viewers online, and then APIs (application programming interfaces) would be available for people to access the models or datasets. The datasets would also go into our repository at the highest resolution possible, so improvements in bandwidth and technologies can avail themselves of these higher resolution data sometime in the future. As museums, we have this responsibility to preserve our collections, but we also have a responsibility to preserve these datasets, and not many of us are looking at that. We hope to do so by building out the infrastructure needed to manage these datasets into the future.

BC  The question of resolution comes up a lot in these discussions. The instinctive reaction I think, for a museum, is to scan at the highest resolution possible. But

as scanning technology gets better, and while we still struggle with storage and processing power, some people have begun to ask if we really need such high-resolutions for certain scanning projects.

DZ  We can make a case for that strategy already in our mass digitization programme. When we are about to mass digitize a collection, we talk with curators, who are likely to have the most demanding resolution needs, and ask them, 'At what resolution do you need this digitized to enable you to do research from the image?' What they want does not always require the highest resolution. In fact, it often does not. For the botany collections, botanists might ask to be able to see the spores on a fern. So we calculate what that resolution would be and that's what we capture at. For our National Museum of American History, where we've been mass digitizing currency sheets, curators wanted to be able to see the individual engraving marks on the currency. That's a different level of detail requiring a different level of resolution. So it varies by collection and we let the experts – the curators or researchers – drive the resolution need. To make a unilateral decision to scan at the highest resolution possible, in a collection of our scale, would impose astronomical storage and processing demands, for no justifiable purpose.

BC  So you imagine transposing that same idea to 3D scanning?

DZ  Yes, in reality we're actually already doing that. With the objects I mentioned earlier, we didn't do everything to the same level and resolution. Our choice of what kinds of capture techniques to use depended on the use case.

BC  There's much discussion about the necessity of being prepared for new formats. I was wondering how you were preparing yourselves for the emergence of new technologies.

DZ  I was just at a conference where somebody said to me, 'Museums digitize in a way that reflects the past, but you're not digitizing in a way that's considering the future.' He didn't go into much more depth, but it was an interesting statement that I'm still thinking about. There are basic things we can do. We can look at the standards community and see what standards are coming down the pipe, and we're doing that with audiovisual materials now, because some important standards are being settled on in that community. We can make sure our data and materials can adapt to that. But this question really is still making me think quite hard about our processes and how we're capturing data. Is it really reflecting not just standards in the future, but the way people will want things in the future? That is the challenge. I'm still pondering it.

01
The Cosmic Buddha, Freer and Sackler Galleries; image rendered from 3D scan, Digitization Program Office, Smithsonian Institution.
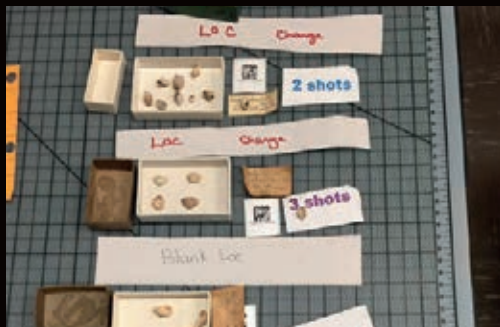
02
Palaeobiological specimens being prepared for mass digitization, National Museum of Natural History, Smithsonian Institution.

03
3D scanning a fossil specimen (MPC 677) at Cerro Ballena, Chile.
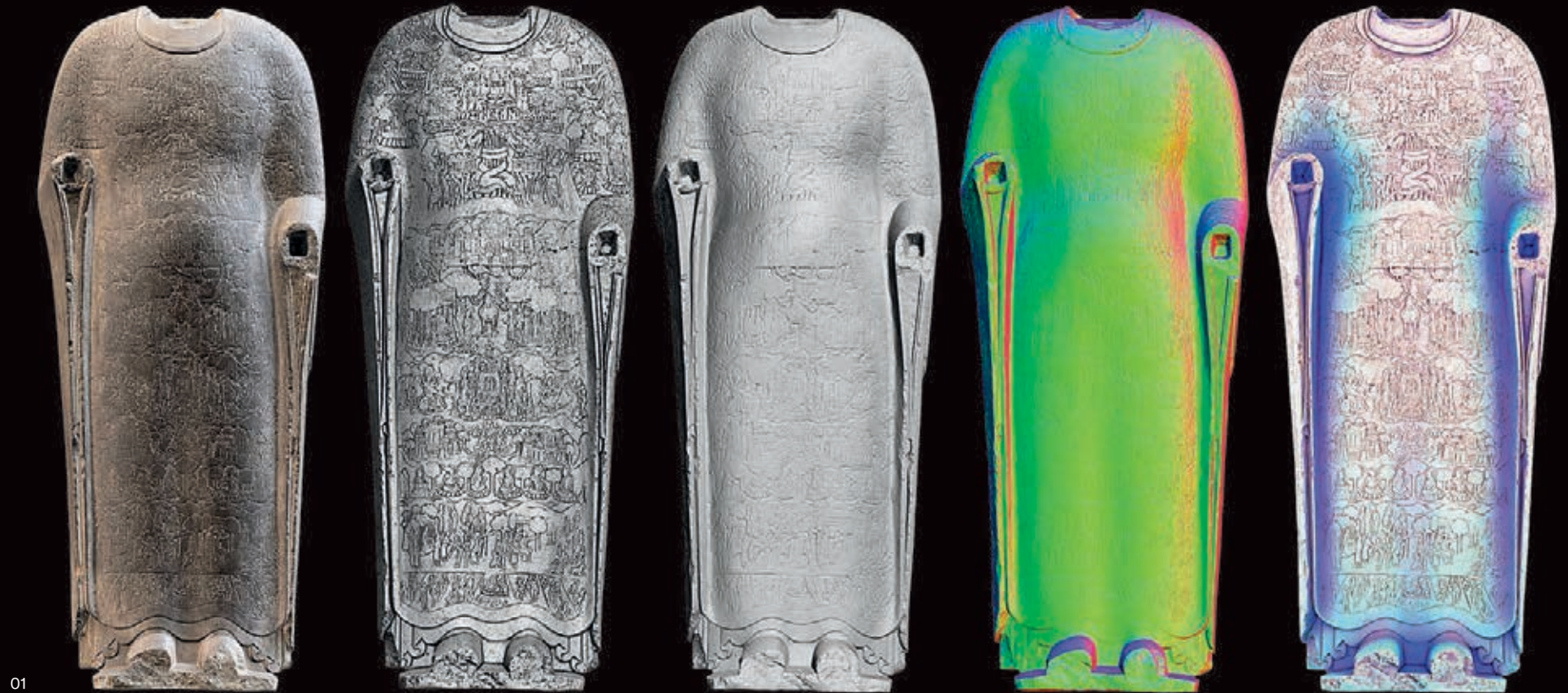
01



02



03



04

04
Smithsonian and Autodesk teams work to 3D scan the interior of the Apollo 11 Command Module at the National Air and Space Museum, Smithsonian Institution.

# Connecting Cultures

# An interview with Laura Jones and Vernon Rapley

At first, the role of a museum in preserving heritage seems clear. It collects and conserves important cultural artefacts. Four years ago, the V&A started exploring ways in which a museum could play a more active role. The project Culture in Crisis is the first result: a series of talks, conferences and working groups, bringing together a diverse group of actors to build future strategies for heritage preservation. Vernon Rapley and Laura Jones discuss the project's mission, what has been learned over the years and the importance of democratizing the way we protect culture.

Brendan Cormier

To start from the beginning, it would be great to know how Culture in Crisis began.

Vernon Rapley

It was a recognition that there was a rise in public need for something to be done, and a recognition that the V&A as an international museum needed to find its place in the global community and needed to do something, not just be passive about it.

I began in earnest in 2013, when Martin Roth, the former Director of the V&A, was aware that we had a unique opportunity because of the internationalization of the museum, and the fact that we had influence around the globe in many different spheres. To some extent, our team was already previously engaged in cultural heritage protection. So the idea was to bring that expertise together to convene a more diverse audience, beyond just museums and conservation groups, to discuss post-conflict resolution and what roles cultural heritage protection, preservation and rebuilding could have within that. We're really interested in working with different academics, with people who understand religion, architecture and urban design; people who come from humanitarian backgrounds, or philosophy; and just bringing all of this experience together to try and understand how we as a whole could assist.

It's really important that we don't try and replicate the work of other organizations, but we try and find areas that are not joined and join them up. Physical reconstruction is an area already quite nicely dealt with. The British Museum are very active in Iraq; the Smithsonian are engaged as well; Blue Shield are engaged. They already have a network, but there are other areas that we felt weren't connected. One of the big ones, for instance, was wildlife: wildlife conservation, biodiversity conservation and preservation. We looked at places like Rwanda as being a model of how wildlife conservation forms the basis of post-conflict resolution. The fact is, their modern society is heavily focused on their biodiversity, on their wildlife and eco-tourism. If that can be used to rebuild the country, and in a way it already has, then can we take lessons from there to countries where their physical cultural heritage could be used in the same way to aid recovery, to bring a community together, and to build for the future? So in an abstract way, that's what Culture in Crisis is about, it's about finding these gaps and trying to join people together. To bring the benefits from one discipline and see where they can be applied elsewhere.

BC

You've been achieving this primarily through a series of conferences, right?

VR

We started that way, yes. We brought together conservation people, we partnered with Yale University very early on and we got the support of UNESCO. Obviously, we also brought in people from big museums, collections and cultural institutes around the world. But we also brought in people who had quite an unusual take:

we brought in media, people who were making new films and people trying to preserve heritage at a very local level. The idea was to understand, right from the beginning, that this was not just about buildings, or monuments, or objects. It's actually about culture in its widest form, both tangible and intangible. Now we're really interested in community voice. To look at working with displaced communities and young people from post-conflict zones. To consider why primarily wealthy people from the West are deciding what objects should be rebuilt or restored, and figure out how to give people living in these areas a meaningful voice. I think the next important stage in this project is not just to do things on their behalf, but to actively engage them in the decision-making processes.

Laura Jones

So within the cultural heritage dialogue, you have these large important institutional voices, it's Yale, it's UNESCO, it's big NGOs, it's an international community. But that needs to be counterbalanced by those voices that come from the grass roots, led by practitioners who are working often in isolation in quite turbulent environments, who struggle with low funding or simply not having input from the right support network. So if there is one thing that Culture in Crisis is trying to develop behind all these conferences and talks, it's a resource that people can draw on, as practitioners, or organizations, or even at the museum level.

BC

On that note, through all of these talks and conferences, are you starting to formulate certain, more concrete ideas of what a museum's role in this actually should be?

VR

One observation has come through our links with the ReACH program, which this publication is really about – the value of copies for cultural heritage preservation, restoration and rebuilding. There are obvious benefits for preserving things that might otherwise be in danger, through pre-emptively scanning artefacts that might be knocked down in the near future. For us, what's important, though, is the potential for giving access to people in war-torn countries or damaged countries to cultural heritage around the world. To allow them to contextualize and therefore value their own cultural heritage. How would someone from a local community, whose ancient temple has been knocked down, actually really understand the value of that unless they can understand how it is important to a broader world history. How does it relate with other people's cultural heritage?

How will that destroyed temple get local support for its rebuilding, if it's just considered another old object in the middle of somewhere that's not doing any good for the local community? If through a global circulation of online scans of cultural heritage we can enable people in those areas to understand, witness culture from around the globe, I think that will enhance their understanding

of how cultural heritage fits into their local context, and why it's important to preserve it. We were talking to a woman who was preserving churches in the Philippines, especially ones that had been knocked down by floods and winds. She very carefully looked at the needs and asked: do I rebuild this as a historic church exactly as it was before the tornado knocked it down? She would go the community and ask them that question and they would say, no, what we need is somewhere we can meet and conduct the services and have community meetings, and we don't really want you to rebuild the church because it will fall down again the next time a big wind comes. So what we'd like is for it to be improved and developed, but we still want to keep a sense of that history in its original structure.

Page 38    In other words, <u>allowing for the organic growth of culture means we need to engage the community and what purpose it has for them</u>. Is it just a tourist attraction that will bring financial benefit, or is it there because it has symbolism or benefits the community in some other way that needs to be captured?

LJ    Even in those ancient sites there is lived culture, there is living importance to people who are either living nearby or engaging directly with that object or practice. Perhaps in the West, we're slightly more focused on the historical importance of a site without necessarily coming to understand the lived culture that plays out everyday there.

BC    Is there a potential criticism here of museums, who might be putting more importance on the welfare of cultural objects than human beings, a scenario which is elevated in places of war and conflict at the moment?

VR    There has to be a balance. Without a culture, a country and its people lose their identity. It's about examining, though, what is important in that culture. We've worked in Africa, where intangible heritage is more important than the tangible. It's more important to preserve recipes, dances, dress and song than it is to actually preserve an object for them. So it's about understanding what is important to each community, isn't it?

LJ    There is no question that preserving human life takes precedence over heritage, but then the complete reversal of that is that there is no life without culture. You will preserve life in a more philosophical manner by preserving culture. And you will preserve culture through preserving life.

BC    Let's turn back to 3D scanning and its increased role in heritage preservation. After Palmyra, we've seen several instances of people coming in, scanning it and

reconstructing it in different ways digitally. Is the new imperative to be scanning objects at risk before they are destroyed?

VR    I have an issue with this, because you're still capturing just a moment in time. Was Palmyra in perfect condition four years ago before it was attacked? A digital scan then would have captured a crumbling ruin. And now it's a slightly more crumbling ruin because it's been attacked, and that's part of its history. So to me, a building or a monument has its own organic growth; it changes over time, and then as it falls down, sometimes it's rebuilt. To me the real benefit of digital technologies is that it allows us to capture all of that movement, that transformation over time. Almost like with Google Timeline, it would be great if you could look at a digital representation of what it looked like 20 years, 50 years ago, and so on. So I'm interested in capturing a site, its life, and how it changes. They don't sit statically, and there is no right and wrong point.

Of course, it's still wrong, isn't it, to destroy historical sites and stand there and say, well, don't worry about it because we've got images of it, and we can digitally recreate it. So 3D technology shouldn't be used as an excuse to ignore the physical thing.

LJ    The idea that technology like virtual reality is already making headway in these areas, so you can visit a site, and then with the flick of a button change between looking at something from the fourteenth century to the same site but from a later period, could be a real advantage for historical study, but also for not fixing something visually. It's this aesthetic problem that I think we come back to all the time. Are you restoring for aesthetical purposes? Or are you restoring for educational purposes that talk more about people, and the experience of a place?

BC    I want to touch on the issue of coordination and collaboration. We've alluded to ideas here of how open access to digital cultural heritage would be of tremendous benefit to communities around the world. We've also alluded to uneven distribution of resources for making scans, and smaller organizations who don't have the means to do so. Yet there has been something like seven major scanning initiatives of Palmyra since the initial bombing, all by different organizations, many of whom don't communicate with each other. So there's redundancy taking place, which is all the more frustrating, because those scanning resources could be deployed elsewhere.

VR    The world's a little topsy-turvy at the moment. You've got to look at who's commissioning it, and why. It tends to be people from the West, saying, 'I can go to Palmyra and make a scan.' Then they go to a funder and the funder funds it. What's not happening at the moment is the requests are not truly coming

from the bottom up, or the local communities. When we work with wildlife, it's very different, there's a global understanding of endangered wildlife, and it's incredibly international in the way it's coordinated. They would actually look at an endangered purple spotted beetle from Afghanistan and say, we don't actually need to worry about it, because that exact species exists in this other geographic place, and is doing fine. So we'll put our effort into ensuring the health of the beetle in the place that is already doing better. In the cultural heritage world, we're not in the slightest bit joined up in that way. In other words, Syria is not coming to us saying this is what we need, and this is where we need it, which would allow for a much better coordination of tasks and allocation of funds.

LJ  I think to go back to the collaborative aspect as well, it's kind of ironic that one of the biggest benefits about culture is the fact that it's so multifaceted. It touches people on so many different levels and everyone will draw a unique interpretation of the value of something. We've entered this situation where culture is politicized, it's a victim of commodification, it gets militarized in battle and exploited for its perceived value, to its detriment.

BC  That brings up a tricky conundrum for people working in cultural heritage, doesn't it? We work to build up a sense of value for cultural goods, but then that value can be turned around and weaponized by people, as we see with ISIS.

VR  If you look at the wildlife conservation world again, I think things are managed in a very clever way. If you list where every species is, and every egg is, then people will go out occasionally and do bad things and pinch the last orchid or steal the last egg. But there are far greater benefits in sharing that information than keeping it secret. If you look at how wildlife conservation crowdsources much of its data, they have a site with 2.5 billion records of people who have seen things and record where they are. So you can build up a true pattern of where these species exist, that could never have been done just by experts. Millions of people engaging in it, particularly in the bird world. It seems there are eight bird watchers for every animal spotter. We don't do anything like that in the cultural heritage world, we don't ask the community what's important to you, what buildings would you want to preserve, what buildings would you want to photograph? It's not just about capturing the images, it's about knowing what they are and where they are.

Then they take it a stage further, because having mapped everything out, they can then map out climate change and they can see what areas are coming into danger, and act accordingly. Now, again in cultural heritage, we could do that, we know where ISIS for example is spreading, and we can look and think where there are

pockets of cultural heritage that need protecting and preserving and focus efforts on that. But we don't do that.

LJ  And it's not just the advancement of troops either, it's mapping out things like urbanization and agricultural practices which are a huge issue for heritage preservation beyond violent conflict.

BC  What's next for the Culture in Crisis project? Where do you envisage it going from here, or does it have an end date?

VR  It has an end date: when culture is no longer in crisis! I think as I said at the beginning, it twists and turns to find its place and to find what's needed. So I don't see there being an end to it, I think it will manifest itself in a whole variety of different ways, working with new partners and finding new opportunities. The big drive for us at the moment is to work with young people in this country, displaced refugees, and to try and bring them into the debate. Many years ago, I experienced something in Colombia called heritage scouts, which were young people who were taught how to value their cultural heritage and then advocated for its preservation within the local communities. That's something we saw in Rwanda as well: where you teach the schoolchildren about the value of preserving it, they take it home and they tell their parents about it and tell their grandfather who is still out there shooting gorillas. You accept that as well, you accept that there will still be a certain loss of gorillas through poaching, because that generational change is not as completely affected. So to us that's probably the big thing at the moment – to get youth engaged.

LJ  I'm hoping that <u>in the future, the focus will be more on democratizing heritage conservation through the support of intangible heritage preservation</u>. When we
start talking to the wider public about their personal heritage connections, I think through the exploration of intangible preservation, we'll be able to foster more support with this, to bridge that gap. So that it becomes as commonplace to everyone as thinking it's important to save the mountain gorillas of Rwanda, something most people would take as self-evident. It should be the same with preserving heritage, and, by extension, people's identity.

# Project Profiles

# The Zamani Project

CAPE TOWN, SOUTH AFRICA
2004–PRESENT

Scanning landscapes of African
cultural heritage.



The Zamani Project, initiated in 2004 at the University of Cape
Town, aims to create digital records of cultural heritage sites
and landscapes across Africa. The project team takes a holistic
approach to spatial documentation, combining technologies such as
laser scanning, photogrammetry and GIS (Geographic Information
Systems). The work addresses the often under-documented nature
of much of the continent's cultural heritage. The project was initiated
to increase international awareness of Africa's heritage, and to
provide material for research and education, while at the same time
creating a permanent metrically accurate record of important sites
for restoration and conservation purposes. They have documented 61
different sites and created 186 models, including the forts and castles
involved in the trans-Atlantic slave trade, adobe mosques in Mali and
historic baths in Zanzibar.

# Iconem

PARIS, FRANCE
2013–PRESENT

Using drone technologies
for rapid-response scans.

Iconem is a young Paris-based start-up using drone technology
as part of a wider kit of scanning tools to create large-scale, high-
resolution scans of heritage sites. In recent years, they have been
particularly active in Syria, partnering with the Syrian Directorate-
General of Antiquities and Museums, to scan at-risk sites, and sites
which have been damaged during the Syrian War. Their organization
has distinguished itself by being fleet-footed in their methodology,
often venturing to still-active conflict zones, in order to capture
digital records of sites considered to be highly at risk. In 2016, they
collaborated with the Grand Palais and the Louvre to produce the
exhibition *Sites éternels*, in which immersive 3D experiences were
created to explore four endangered cultural heritage sites in the
Middle East.

An Iconem team member
scanning the Meroë
Pyramids.

A 3D model of the
Triumphant Arch in
Palmyra, digitally
reconstructed by Iconem.

# Describing Egypt

CAIRO, EGYPT
2012–PRESENT

DIY 360-degree imagery
of hard-to-access Egyptian
cultural heritage sites.



Describing Egypt is a project initiated by Salma El Dardiry and Karim Mansour in 2012, which seeks to build a publicly accessible archive of 360-degree imagery of heritage sites across Egypt. The imagery can be viewed on a web browser or with a VR headset, allowing you to walk through sites which are often difficult to access because they have been closed by authorities, or are hard to travel to. The project aims to also pair these immersive environments with stories from these locations, and from the various people who have inhabited them. Describing Egypt is a good example of how digital preservation projects can be undertaken not just by large heritage organizations, but also by individuals on a shoestring budget with a passion for local culture.

# Rekrei

2015–PRESENT

Using crowdsourced images to
recreate digital models of lost or
damaged heritage.



Rekrei is a project that uses crowdsourced images to recreate digital models of lost or damaged monuments and artefacts. The project began under the name Project Mosul in 2015, and was set up by two digital archaeologists, Matthew Vincent and Chance Coughenour, who sought to address the destruction of artefacts by ISIS at the Mosul Cultural Museum in Iraq through digital reconstructions. Rekrei evolved into a web-based platform that collects publicly available data on the Internet to recreate digital models of artefacts through the process of photogrammetry. As more images of lost artefacts are found online, the better Rekrei can create faithful 3D models of those lost artefacts. Early examples of their recreated artefacts include the Lion of Mosul from the Mosul Museum, and a replica of the Nirgul tablet and statue of a Hatrene priest from Hatra. It is the first project dedicated to the digital preservation of lost heritage through crowdsourcing.

# STORE

Collections have always been burdened by the physical limitations of space. Museums rent cavernous warehouses, with carefully controlled environments, to store a growing number of objects that vastly exceed the museum's ability to display them. The digital world promises to address the problems of storage in dramatic ways. File folders, tape reels and other methods of storing information are now being transferred en masse to the cloud. But 'the cloud' is a misleading euphemism suggesting that space is no longer an issue; indeed, servers are physical things. They are as vulnerable to decay and loss as any other object. In response, museums and computer scientists are racing to devise new strategies to make sure our digital heritage is maintained and usable in the future. Just as we collect cultural objects with the goal of keeping them forever, we need to think of data with the same long-term mandate.

Marion Crick

Page 102    '... the challenges we may see as technical were sometimes generated by decisions made at the point of creation.'

Search       'technical, creation'

Result       Plate
             Sèvres porcelain factory, 1847

Source       V&A online collections

Marion Crick

Page 104 'Collected software introduces us to the challenge of platform and hardware obsolescence.'

Search       'challenge, platform'

Result       Raphael (artist); George Baxter (print maker)
             *The Death of Ananias*, print, 1855

Source       V&A online collections

Carla Schroer

Page 111 'It's also not enough to just have access to the information that people are putting out there. You have to have some way to assess it and understand qualitatively what you are looking at.'

Search       'not enough to just have access'

Result       Mask (tapuanu)
             Caroline Islands, Nomoi Islands, *c*.1885

Source       Los Angeles County Museum of Art online collections

Carla Schroer

Page 109 '... everybody agrees we need metadata. But I don't think there's widespread agreement on what that metadata should accomplish.'

Search    'widespread agreement'

Result    *Water Buffaloes in a Mountain Valley*
          16th century, Korea

Source    Los Angeles County Museum of Art
          online collections



Carla Schroer

Page 112 'We tell people all the time, if you don't know why you're digitizing this, or what questions you are trying to answer about it, then you shouldn't be doing it.'

Search    'what questions you are trying to answer'

Result    Cleopatra
          William Wetmore Story
          Modelled 1858, carved 1860

Source    Los Angeles County Museum of Art
          online collections

# Preserving the Digital House of Cards

# Marion Crick

As museums race to digitize their physical collections, and increasingly collect 'born digital' pieces of art and design, the urgent question for any administrator is: where do we put it all? Digital asset management, a term encumbered by its own prosaic sound, is now tasked with wrestling some of the most urgent questions facing museums: the future sustainability of our digital collections. Marion Crick, Head of Collections Management at the V&A, unpicks here the multiple challenges ahead.

Digital technology offers immense promise, but behind the scenes there are hard everyday battles that need to be fought and won. Almost 20 years ago, I wrote my masters dissertation on the challenges faced by a photo archive in shifting from analogue to digital. 10 years later, I wrote a best practice paper for storing and managing digital images in botanical collections. The challenges persist today in new forms. And there is no surprise in this: as digital technology changes, we are constantly reviewing the opportunities it offers and redefining our ambitions. What obstacles do we face now – and in the next 20 years?

Two years ago, my team at the V&A conducted a museum-wide, interview-based, user consultation as preparation for a new digital asset management system launching in early 2018. In our interviews, we defined digital assets as any digitally manifested item that the museum wished to store and preserve for future access, whether this be single file assets (images, documents) or complex digital objects with an internal file structure (software applications). We asked two simple questions across the entire museum: firstly, 'What do you currently do/want to do with digital assets?' and secondly, 'What do you need in order to be able to do it?' We discovered that, as individuals and as an organization, the challenges we may see as technical were sometimes generated by decisions made at the point of creation. We also realized that, although we were trying to build a new system to meet these needs, the concerns of our colleagues are often process- or knowledge-based, so any solution needed to be both technically sound and intellectually accessible to staff.

THE DIFFICULTY OF SETTLING ON A SINGLE FILE FORMAT

The greatest concern we encountered is that, in the creation of digital assets, we have a proliferation of file formats to maintain. This is something we have in common with other collections. The National Archives Pronom database, which lists the file formats that archives are required to preserve, currently lists 1,553 different types.[1] Our survey at the V&A revealed that, between our users, we need to support approximately 60 of these on our new digital asset management system.

Maintaining future support for these formats also needs consideration. Within our list of 60 file formats, we require support for nine raster image formats (the majority of digitized images are raster files). Why do we have files other than the most commonly known TIFF and JPEG standards? These files tell the history of our image management, as each format will have been adopted for a specific purpose at the time of digitization. Of these formats, one is now obsolete: the Kodak PhotoCD. This was launched in 1992 to store 100 high quality, high resolution images on a CD

ROM, which meant that it was a very attractive and economical proposition for those heritage collections aiming to digitize transparency collections in bulk at a time when storage was comparatively expensive. A further four formats we store are proprietary – which means they are created by a software supplier and require specific software from that supplier to read them. In our case, these are a series of formats developed by Adobe within its Creative Suite of applications.

VOLUME OF PRODUCTION

Another challenge we face is the scale of production, both in terms of the number of files and the overall volume of data produced. In 2007, the V&A stored 29,000 images in a new digital asset management system, VADAR. 16,000 of these were images related to our collections. To date in 2017, we have added 156,000 digital assets, of which 100,000 are images of our collections. While the increased data offers challenges, it has occurred through our growth in opportunity, ambition and technical capability. Our current target for collections digitization is 80,000 items per year, compared with 40,000 three years ago – this increase will allow us to meet our goal of digitizing the entire collection within 10 years. To achieve this, we have democratized digitization as an activity within the Museum through reviewing standards and responsibilities, providing equipment and advice to a range of colleagues, rather than relying solely on professional studio photography, which has been made possible through improvements in consumer camera quality. In 2007, the V&A's benchmark for digital image formats was at least partially commercially driven, requiring a file suitable for commercial publication up to A3 in size. The equipment needed to create this quality of image was mostly inaccessible outside of a photographic studio. We now have a second benchmark, which is to provide a 'record' image for every object in our collection, the purpose of which is to provide uninterpreted visual information about the object. This secondary benchmark can be achieved with current consumer cameras, operated by curatorial colleagues, conservators and technicians.

WHAT SHOULD WE PRESERVE?

The first questions to ask around managing our digital collections are strategic, rather than technical. These are, in order: 'Why are we maintaining this information?' followed by 'What is the object we are keeping?' and, only then, 'How will we keep it?' For the proprietary image file formats previously mentioned, the question is relatively simple – is the file important for its unique technical properties or for the information contained within? This will answer the question of maintaining the formats and the software to access them versus migration to a current standard.

We do, however, have far more complex digital objects to maintain. These are objects which comprise several digital files in a range of formats, with a specific internal structure which makes them technically viable. Here, the preservation strategy will necessarily be more complex. I will look at two examples of complex digital objects here – 3D photogrammetry models and collected software. Between 2008 and 2011, the V&A was a partner in 3D-COFORM, a project established to advance the state-of-the-art in 3D digitization, which created a repository of partners' 3D content and a set of software tools for working with 3D models. The software used was built through a research project, so not maintained, for reasons explained later. The final outputs were presented as Flash videos, the standard for web viewing at the time, using the Flash Player web browser plugin. This plugin is now unsupported in web browsers on mobile devices. In addition to the 3D models, we also stored the 2D images used to create the models. This decision to store the source images alongside the output and the software has meant that both the 3D-COFORM consortium and our own digital media team have been able to experiment with migrating the output to open standards framework-based presentation (HTML5 and IIIF respectively), which allow users to access the models without installing proprietary software plugins in advance.[2]

<u>Collected software introduces us to the challenge of platform and hardware obsolescence</u>. Within the last five years, the V&A has collected Flappy Bird, an unsupported gaming application, and WeChat, a social media application, which are both designed to be experienced on mobile devices. For now, we have chosen to store the software in the form of an APK file and smartphones running the Android operating system used at the point of acquisition, but we have not yet chosen our preservation strategy for the software. Preserving the software applications that we collect is particularly challenging. The manufacturers of computing devices have designed obsolescence into both the operating system and the hardware as part of their commercial model. In the case of Flappy Bird, which was released as recently as 2013, both the Apple and Android operating systems on which it was developed are now no longer supported. So how do we ensure that museum users of the future are able to access these applications in a way that ensures they understand the significance of these objects of digital design? The answer which is often proposed is emulation – recreation of the software functions using different software or on a different type of device. But where the design of the software includes the experience of using the software, can a traditional emulator really be the answer or does the process of emulation change the authenticity of the experience? Would providing access to one of the online recreations of Flappy Bird now available fulfil our commitment to provide access to our collections? The answer depends on our response to the strategic questions outlined for digital preservation above.

HOW DO WE FIND WHAT WE NEED?

In an organization that archives over 150,000 digital assets per year, the quality and structure of the information that surrounds those assets is vital if you want to find a specific item. In our survey, the problem that most of our users outlined was not that they could not find what they needed, but that they were overwhelmed by the volume of images in their search results. Further investigation found that while images had been catalogued with keywords, there was not enough granularity in keywording and, moreover, categorization of assets was difficult to guess.

BALANCING INNOVATION AGAINST ACCOUNTABILITY AND GOVERNANCE

In 2017, the UK Government stipulated that all publicly owned organizations in the heritage sector achieve Cyber Essentials accreditation, a standard for networked computer security. In addition to requirements for more commonly recognized measures like virus protection, organizations are expected to ensure that installed software is supported by a software company or developer that can commit to updating this software for its entire life. This has introduced good practice in computer security within the UK heritage sector, which in terms of accountability and governance is positive. The V&A met this standard, alongside a number of our peers, and in the process replaced some software that was in use which did not meet these stipulations. We anticipate further impact on innovation in digital practice as a result of these measures. At present, we are aware that some of the open-source and research-developed software tools which have supported the development of digital practice may not be available to us, so we cannot depend on them for our preservation strategies. But this may also have further implications for our digital collecting ambitions. If we wish to be able to use Flappy Bird, is this practice compliant with government policy? Would we be allowed to collect computer viruses as an example of digital design? These are questions which we need to explore with the IT security experts in our organizations, working with these colleagues as strategic partners, rather than service providers or deniers.

UNDERSTANDING THE COST OF DIGITAL WORKING

The final and greatest challenge of managing assets is the most prosaic, and one which is not always recognized at an operational level – the cost of creating and managing digital collections. There is often a perception that digitization is cheap. At the V&A, for £200 we provide curators with a record photography kit, which includes a reliable (in terms of physical robustness and consistent

output) consumer camera and a lighting set-up, suitable for photography of small 3D objects in our collections. After the initial outlay for equipment, there are no consumables such as film or paper. Digital images can be stored and shared through personal accounts on social media platforms. Colleagues who are interested in taking the first steps in 3D scanning are able to start with their existing camera or even their phone, free post-production software, free platforms for publication and communities for experience-based support and training. These tools and platforms can create an illusion that everything digital, including storage, is low-cost or even free; but on an institutional level this is not the case. The creation process is only the start of the asset's lifecycle. All of the management challenges outlined above have a cost attached to them. The Keeping Research Data Safe project costing model, based on lifecycle management of archaeological data, identified that, while 55% of the cost of a digital archive is borne at the time of creating and storing the data, lifetime storage maintenance and data preservation will account for an additional 15%, and maintaining access will account for 31% of lifetime costs.[3] This is a very real, yet frightening concept for any organization.

MEETING THE CHALLENGES

Despite these challenges, I am optimistic. We have come a long way in the last 20 years, creating sets of resources which allow audiences to see our collections in their own home, curators to start building an exhibition from their desktop, and conservators to share up-to-date condition information with colleagues efficiently. These colleagues have come together in the V&A to form a large and engaged working group that has collectively written the specification for our new digital asset management system, and is now working on our digital asset policy; a group that, as well as defining working practices, embraces ambition. I believe that, in working collaboratively with our colleagues both inside and outside the museum we can build solutions together. I also think that although the problems we face are technical, the technical solutions identified are secondary to the principles of collectively understanding our digital collections. As our understanding of these collections develops, our ambitions for using them will grow, and the technical solutions will develop over time. This move towards creating strategies for management and access, rather than mere standards or platforms, provides us with an opportunity to create sustainable sets of resources which we can feel confident will continue to exist in future structures we have not yet imagined.

# Keeping Track of How We Scan

# An interview with Mark Mudge and Carla Schroer

An ever-increasing amount of scanning initiatives are taking place around the globe. They vary from community-led projects capturing local heritage, to large-scale operations carried out by the world's leading international preservation organizations. With so much activity generating so much data, how can we keep track of what's being captured and how? Mark Mudge and Carla Schroer, founders of Cultural Heritage Imaging, are acutely aware that no two scans of the same thing are alike. Here they discuss their initiative, the Digital Lab Notebook, an effort to make scanning efforts more transparent and useful through a universally shared ledger.

Brendan Cormier

Could you start by telling me how Cultural Heritage Imaging began as a project? Where did you see a need to start a project like this?

Carla Schroer

My background is in computer science and software development. I worked in Silicon Valley for 20 years and was part of the team that brought Java to the market in 1995. Mark's background was completely different: he studied philosophy, spent 10 years as a bronze sculptor, and started doing early 3D-modelling and laser scanning in the late eighties as a method for working with his art. The impetus for both of us was simply that we wanted to combine our different skillsets and apply them somewhere we could add value. We both cared greatly about history and art, so digital imaging was an obvious fit.

When we founded Cultural Heritage Imaging in 2002, it was still pretty early on in terms of the technology of digital photography. We spent a lot of time meeting people and saying, 'Here are these digital tools, how would you use them, and how could we make what we know useful to your field?'. It became clear that there was an enormous amount of work to do to make digital imaging practical, affordable and precise enough so that it could have value for museums and scientific study. So an early

Pages 116–17

goal of ours was to find a way to produce scan results where if you scanned the same thing five times, all of the numbers and data are going to be the same; so to produce a reliable consistency. If you can't do that, then you really don't have a scientific object of study, your 3D model is just fancy entertainment.

In 2004, we started raising the issue of how you keep track of what you're doing, keeping records of how you have scanned objects, so that other people are able to assess and re-use your data. We stressed the importance of that. That was the beginning of our thinking about what became the Digital Lab Notebook (DLN) project, which serves essentially the same function as a scientist's lab notebook before the digital age. It started as a set of principles, based on maximizing the transparency of robust digital representations. Now we are building software that helps record how a digital representation is made. The DLN describes the means and circumstances of digital information capture from a 'real

Page 118

world' subject and tracks all the events that happen during the processing of this information into a completed digital representation. There were a lot of people that had never thought about that.

The result is scientific metadata for complex, image-based technologies that record real-world subjects, such as photogrammetry for 3D models and Reflectance Transformation Imaging (RTI) for capturing very fine surface details of subjects.

Mark Mudge

If I can hazard a few words about metadata standards: we chose to adopt the International Council of Museums' and the International Federation of Library Associations' jointly recommended Conceptual Reference Model (CRM) standard along with Linked Open Data as a shareable way of representing the metadata. These organizations jointly adopted the CRM standard in 2016. This is the first time in history that international library and museum organizations have been on the same page about metadata standards.

BC

Nowadays, the importance of metadata is quite widely accepted and understood, especially in the museum world – the idea that museum assets need to come linked with a critical set of information about what that object is, its maker, and so on, as it circulates through the Internet. I imagine that the concept of the Digital Lab Notebook, where you embed knowledge about the scan itself, is gaining more recognition and validation. What are the complications of instituting it in a widespread way?

CS

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As you said, everybody agrees we need metadata. But I don't think there's widespread agreement on what that metadata should accomplish. Our goal is that you have enough information so that somebody else can look at and assess your result and also re-use your data for their own novel purposes, both now and in the future.

MM

One essential design principle of the Digital Lab Notebook was to keep the entire user experience based on straightforward ordinary language. The DLN tools are in the process of internationalization, which greatly decreases the cost of software translation. Our idea is that everyone should use their own ordinary language. All the DLN's semantic metadata management involving the Conceptual Reference Model and its transformation into Linked Open Data is completely automatic and 'under the hood'. The user doesn't need to understand anything about it. This resolves questions about the CRM's ease of use. This is also a dramatic simplification of how someone goes about doing scientific imaging. We believe this simplification will lead to a widespread democratization of documentary technology.

BC

Surely, there's also the provenance of the data, which needs to be recorded: when the scan was taken, who did the scan, with what equipment, who authorized it, and the question of ownership.

CS

Yes, absolutely. Our initial approach with the Digital Lab Notebook was to say, how do we create a methodology and practice that collects the information that's necessary to meet our goal? Now, we're looking at how we organize and manage

that information to make it more searchable and usable and allow it to link to other information about the subject matter. Looking at how we can not just collect some basic data but organize and manage that data, give it the richness of a semantic world and the ability to start linking up with and being able to work with other data. Because the people taking the images are not necessarily the people that have the expertise on the subject matter, but you want to link to whatever information there is on the subject matter.

MM     Entering metadata can be an arduous task, so with the Digital Lab Notebook software, we've tried to make it very simple. Before the imaging begins, you do spend a little tedious time entering data. This information describes what equipment is available to you, your organisation and its people and the project stakeholders. This is a one-time operation. As you get ready to scan, you follow a simple procedure to select the equipment you are using from the master list, the rights statements, the people you previously described who are doing the imaging, the location and time and date of capture. You can then add identifying information about the subject. This can be an accession number, Getty name, GPS location or other identifying data. Then, this information can be re-used and edited for subject after subject with just a few mouse clicks.

CS     Just to add to that, it's not our job to tell people the level of detail that they should be inputting as metadata. We have a system that can manage a pretty complex and detailed set of information, but you're not necessarily required to do that. If you don't have any interest inputting the price of your equipment, you don't need to do that, but if you want to do that, it's there and it's semantically mapped out for you. So it's flexible. The other thing is that it will be open source, so you will have a lot of flexibility to extend and build out the details in a way that makes sense for you and your organization.

In terms of the issue of rights, there is a website called 'RightsStatements.org' and basically what they did is look at the kinds of data that people were contributing to these massive platforms like the Digital Library of the Americas and Europeana, and came up with 12 categories of rights that describe how the data can be used. You can specify the set of intended usages for your data, so that it's searchable and so that people can understand it. We've adopted that system, so people can specify the usage rights in a clear systematic way.

BC     I'd like to discuss the problem of getting different scanning projects to communicate with each other. We've seen already a lot of repetition in the scanning of certain sites, for instance Palmyra, where there's very little communication between the different funders and actors scanning the same site,

and very little sharing of their data. That leads to a lot of opacity and redundancy. How can that be resolved?

MM     If you have linked open data that describes the geographical location of your project, that describes the stakeholders in the project, that describes the imaging subjects of the project, and you're publishing it on the web, that stuff should start linking up, which would provide anybody who is interested a map to all the different things going on with that particular site.

BC     The missing link there is that it has to be published on the web.
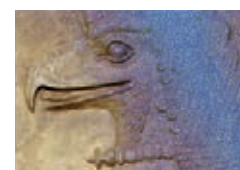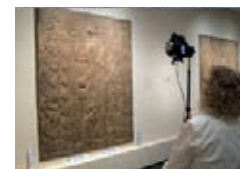
CS     It has to be published in some findable way, yes. But <u>it's also not enough to just have access to the information that people are putting out there. You have to have some way to assess it and understand qualitatively what you are looking at.</u> Some groups have been really good at being clear about how their data was collected. For example, if they used crowdsourced images, there might not be enough data, so there are holes or gaps in their models that they've had to fill in by hand. That needs to be clearly communicated. But not all groups working in Palmyra have done that. That's problematic.

BC     Rekrei, which was formerly called Project Mosul, most notably started a few years ago using crowdsourced images to try and rebuild models from Hatra that had been destroyed by ISIS. They're quite open with the fact that, of course, when you start looking at tourist photos, there are quite a few angles that people don't take of the object. The digital object you're going to get, modelled from those few photographs, is far from perfect. But of course, the logic is that any kind of reconstruction to give a semblance of a subject that was lost has value. I suppose you're saying that we just need to be absolutely transparent about that. So, if something has been half-modelled by hand, because it's based on three photographs, there needs to be a way of clearly communicating that.

CS     Exactly. If something is lost, anything that we can reproduce is a million times better than nothing, but we need to be honest and transparent about what it is and which parts of it are reliable and which parts of it are guesswork. I think that's one of the biggest issues, even with material that hasn't been destroyed.

BC     I'd like to shift to the perspective of the museum. The V&A has 2.5 million objects in its collection. For over a decade, there's been a concerted effort from our photography studio to make two-dimensional digital scans and photographs to capture as much

as possible from the collection. We still have a long way to go to capture everything in 2D. If you're looking at it from a museum administrator's perspective the question arises: do we need to be making 3D scans of everything we own now? With the possibility of scanning everything, but with the inherent costs involved, how do we then discern and strategize what's worth scanning and what's not?

MM　　Let's go back to your museum administrators. If they're thinking about 3D models, they're going to have questions. How much is it going to cost to get the equipment? How much is it going to cost and how much time is it going to take to train people to use it? How are you going to archive this stuff once you get it scanned and in a form where it can be re-usable? Photogrammetry now seems like a better option than laser scanning. You already have a photo studio and people know how to use a camera. By making a model, you're generating a lot of archival images, which are stored as JPGs or TIFFs or other common image files, which you know how to store.

CS　　You'd still have to make decisions, because it takes time to do this and there's still data to be stored. I think there are two levels of decisions. One is to prioritise what you want to scan or produce in 3D, and that's going to be driven by the material and how you perceive people's needs to look at or see the material. And then you have to answer the secondary question, what is a reasonable level of resolution and precision to meet the goals of whoever might be using the resulting data? That gets a little tricky when part of the goal is that the data is used far into the future, and you don't know how people will use it in the future. That's what drives this idea that you always have to scan at the highest possible resolution but I just think that's so impractical that you've got to make some trade-offs. <u>We tell people all the time, if you don't know why you're digitizing this, or what questions you are trying to answer about it, then you shouldn't be doing it.</u>

BC　　How do we engage communities and other people to get involved in 3D scanning? A museum or an organization can invest in the infrastructure to do 3D scanning, but the technology, especially photogrammetry, has enabled anyone with a camera to get involved if they like. That has a lot of potential, because it means a lot more artefacts can be scanned, but it also potentially means a lot more people can become stewards of cultural heritage through 3D scanning work.

CS　　That's the core principle of our work, it's not about us running around scanning things; it's about us empowering other people with these tools. That's why we think it's so critical; that's why we focus on computational photography-based techniques because digital cameras are widely available and relatively inexpensive

and many people have basic photography skills. It's also why we think the Digital Lab Notebook is so important because you don't want to say, 'I trust the scan because it was scanned by a team from the V&A, or the Smithsonian Institution, you want to say, 'I trust the scan because I can actually look at the data itself and see that it does what I need it to do.' That's why that focus on collecting and managing metadata is so important.

People that are passionate about heritage material and want to see it protected should have these tools, so that they can be part of preserving it and protecting it. I think the opposite thing, that we often overlook, is this almost colonial approach to scanning which has been happening around the world, where people from wealthy countries and wealthy institutions run around with expensive equipment and scan what they think is interesting and important and run away with the data, while local people often never have access to the data in any kind of way that's useful to them.

MM　　The fundamental idea is, if you have a radically decentralized source for complex digital representations that carry sufficient metadata, all these sources can become available widely and the fact that you're getting a very heterogeneous pile of scientific imaging from all over the world dramatically increases the breadth and scope and richness of the documentation of human culture.

BC　　That's interesting. You mention a decentralized network of stored digital models, which contrasts with other centralized preservation strategies. There's the Svalbard Seed Bank in Norway, for example, which tries to keep back-ups of different seed varieties, so that we can maintain biodiversity in the long run. The tragedy is, the Seed Bank flooded last year because of global warming. That's the classic 'putting all your eggs in one basket' approach. Digital material is just as fragile, so I often wonder what is the most sustainable approach for keeping this data on servers?

CS　　There are a couple things. First, you see a lot of wonderful websites and organizations like Europeana, which make information accessible and searchable. Those are wonderful things, but it is not necessarily a long-term preservation strategy. The Archaeology Data Service in the UK, on the other hand, has been thinking about these issues of long-term preservation and thankfully people are starting to follow their model. It seems pretty clear that you need a system with an absolute minimum of three back-ups, keeping the data geographically separated, ideally more.

We also like to point to the Library of Congress in the US. It has a sustainability section on their website with basic principles. The number one principle is that

you have to pick open file formats and you should pick formats that are broadly in use. There's a range of factors that you should consider in terms of making your data sustainable. Those are not the same factors that you would necessarily choose to say, 'How can I present this information right now to my current public?'

BC When you talk about storing things in multiple locations, isn't that again where we see the value of widespread sharing? I always go back to the case of the BBC who lost their archive of old *Doctor Who* episodes. A project emerged whereby people scoured alternative archives, different broadcasting centres around the world, and private collectors, in order to rebuild the archive of lost episodes. These filmed episodes were being rediscovered in random places around the world, from a television relay station in Jos, Nigeria, to a stall at a New Zealand Film Fair. It was only because versions of the filmed episodes had been shared so widely, that it could be rebuilt after the loss in the centralized archive.

CS I think there's huge value in having things in multiple locations. There's all kinds of material being lost or will be lost as dams are built, as mines are dug, as development happens, as oceans rise, as severe weather events increase, that thinking about digital archives is crucial.

MM Everything we do at Cultural Heritage Imaging is driven by the idea that we want to see regular people all around the world able to document their heritage. We want them to have confidence that their work will be re-used and they can prove to anyone that their work is high quality. When climate change really starts hitting the fan, you're going to need many hundreds of thousands, if not millions, of people empowered with the knowledge of how to scientifically record and archive imperilled heritage, to save even a small minority of the material that's going to go away. The idea of having 500 super high-end specialist groups with million-dollar budgets and expensive pieces of equipment, going around the world, often scanning the same things over and over again, is not going to cut it. It's not going to make any appreciable difference for the 99% of humanity's legacy that will otherwise be lost.
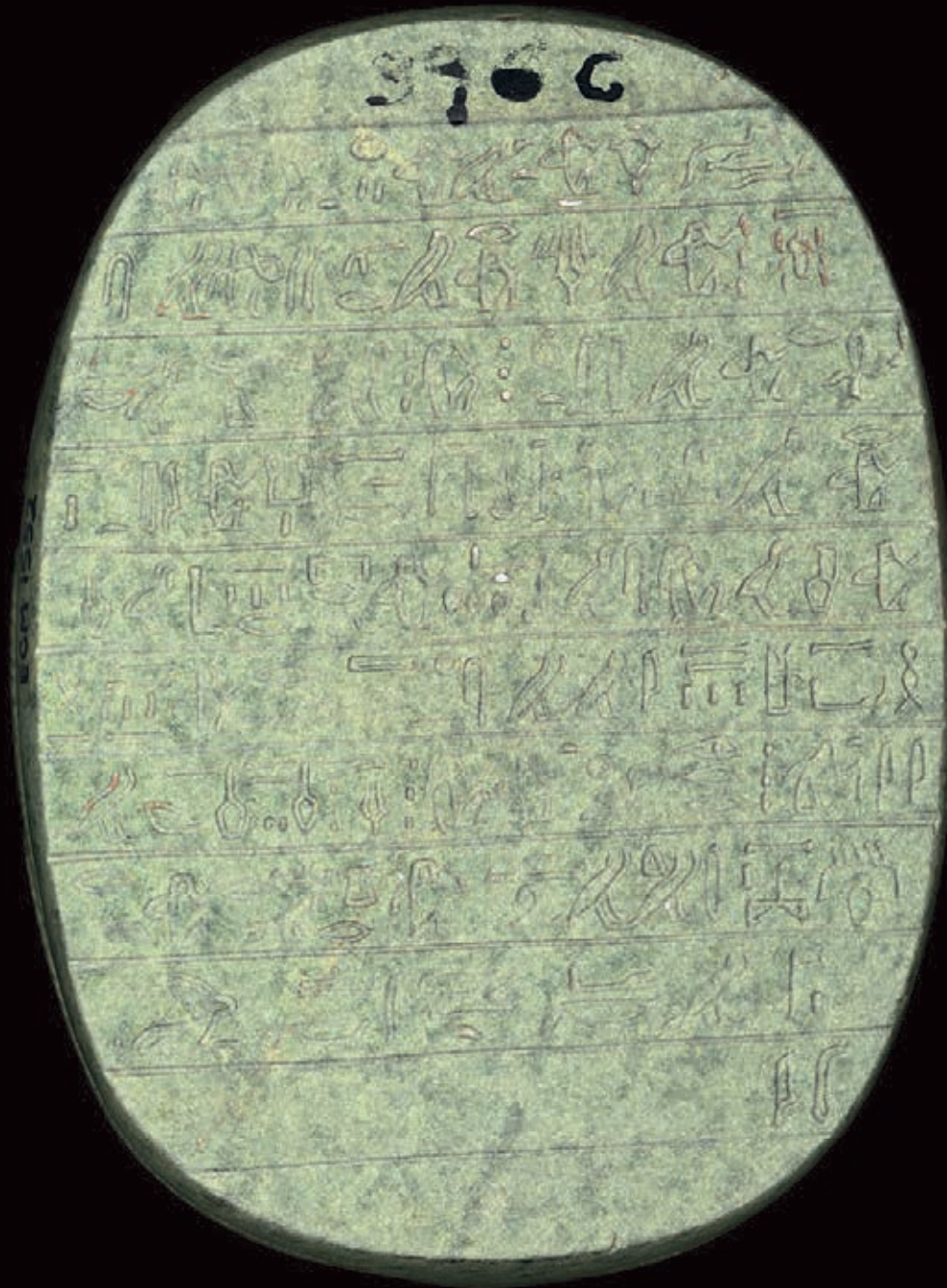






Pages 120–1

Scarab with inscriptions, from the Eton College Myers Collection. In the left image, mathematical relighting has not been implemented. In the right image, mathematical relighting has been adjusted to show details difficult to discern with the naked eye.
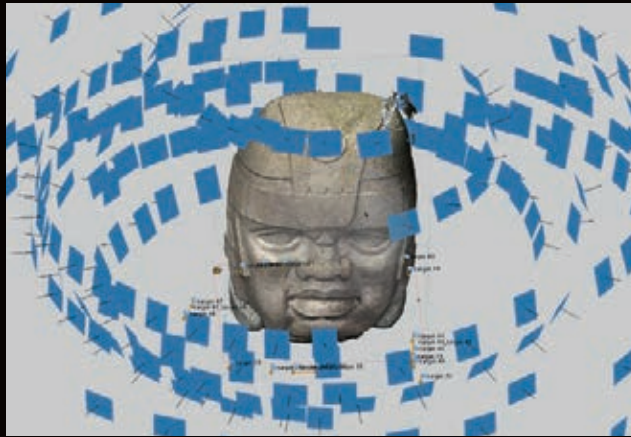
02

02
Post-processing screen shot from AgiSoft PhotoScan. The blue rectangles each represent a camera position.

03
Photogrammetry training session of the Olmec Head at San Francisco City College.

04
Scanning the Eagle-Headed Deity, Neo-Assyrian period at LACMA.

05
Composite-view detail from an Assyrian bas-relief of an eagle-headed deity, showing mesh geometry and texture.



03



04–05

06    07



06
Shooting a colour card
to go with the 3D subject
images.

07
Using a flashlight to
check for shadows from
the spheres used when
collecting RTI images. The
spheres allow software to
determine where the light
was in each of the images
in the image set.

08
Positioning the flash for
RTI image capture.

08

# Project Profiles

# The Internet Archive

SAN FRANCISCO, USA
1996–PRESENT

Archiving the Internet to provide
universal access to knowledge.



Founded in 1996, the Internet Archive works to preserve as much
of the Internet as possible. Its web archive contains over 150 billion
web captures, essentially creating backups of Internet data stored on
over 15 petabytes of memory. It also provides free public access to its
collections of digitized materials, which include websites, software
applications, games, music, videos, moving images and nearly three
million public-domain books. The organization also carries out advocacy
work, arguing for the importance of free open access to knowledge on
the Internet. The Archive is headquartered in a former Christian Science
church in San Francisco.

# Multiple Arcade Machine Emulator (MAME)

1997–PRESENT

An emulator for recreating arcade gaming experiences.

MAME is a project originally developed to preserve the gaming experience of arcade games, by emulating them as software compatible with modern computer systems. Through emulation, MAME helps to prevent early arcade games, and games that operated on other gaming systems, from being lost and forgotten. It also allows people to engage in a simulated experience of what early arcade games were like. It was originally released in 1996 by Nicola Salmoria, and now supports over 7,000 unique games. MAME is widely regarded as a pioneering project in emulation, and an important case study for emulation as a form of digital preservation.

# Rhizome

NEW YORK CITY, USA
1996–PRESENT

Preserving born-digital art.



I/O/D, *The Web Stalker*, 1997, as re-enacted by Rhizome via EaaS for Net Art Anthology, 2017.

Rhizome is a non-profit organization founded in 1996 which champions born-digital art and culture, with a special interest in digital preservation. In particular, it has developed software tools which enable individuals to build decentralized and vernacular archives of digital content.

Since 2014, Rhizome is presenting legacy digital artworks in contemporaneous emulated computing environments such as Windows 98 on the web, using the framework EaaS. In 2015, Rhizome took on the development of Webrecorder, a tool that allows for the easy capture and reconstruction of webpages. It has also produced a portal called Oldweb.today, which recreates the experience of surfing the web using early web browsers such as Mosaic and Netscape Navigator. By providing such tools, it is helping to ensure that the history of our digital culture is maintained and accessible in the future.

# Collecting Twitter at the Library of Congress

WASHINGTON D.C., USA
2010–17

Comprehensive collecting of social media content.



In 2010, the Library of Congress in the US announced that it would comprehensively collect and archive every single tweet published on Twitter. It was an ambitious move by the organization to preserve digital records from social media. However, the organization has struggled with its collecting, especially as the Twitter platform itself evolved. For instance, in 2011, Twitter added the ability to attach images to tweets, whereas the Library has continued to only collect text records. The expansion of Twitter to 280 characters has also provided challenges. In 2017, the Library announced that it would stop comprehensive collecting, and instead focus on collecting 'historically significant' tweets. The project highlights the difficulties of long-term collecting strategies for digital platforms that evolve over time.

# SHARE

The Internet has radically redefined sharing. Social networks, search platforms and sites like Wikipedia have made access to information, images and video instantly available to anyone with an Internet connection. This openness has forced museums to reconsider their traditional role as gatekeepers of cultural heritage, and prompted the question: how much should we share online? For many, the answer is: as much as possible. After all, if a museum's goal is to reach a public, it needs to put its content where people will see it. And the place where people see it today is, more often than not, online. As collections are digitized and shared, however, several complications arise. One issue is about copyright and the ownership of digital copies. A second issue is about is about the digital divide: the fact that currently half of world does not have access to the Internet. Both challenges will need to be tackled in order for a truly open system of sharing digital cultural heritage to thrive.

Abraham Drassinower

Page 144        '... copyright does not protect ideas.'

Search        'star-crossed lovers'

Result        *The Reconciliation of the Montagues and the Capulets
              over the Dead Bodies of Romeo and Juliet*
              Frederic Leighton, 1950s

Source        Wikimedia Commons

Sandra L. López Varela

Page 152    'Differences in levels of education
            and school enrolment worldwide
            are important factors in Internet use.'

Search      'differences, education'

Result      Argentinian education exhibit
            at the 1904 World's Fair

Source      Wellcome Collection online collections



Abraham Drassinower

Page 143    'The law of copyright is a law
            about authors, not inventors.'

Search      'author' and 'inventor'

Results     Franz Kafka, 1917
            Marie Curie, 1920s

Source      Wikimedia Commons

Sandra L. López Varela

Page 150

'... economic differences worldwide have established a gap, a digital divide, which has slowed down the appropriation of our belief that we can create a better world by sharing knowledge and information through ICT.'
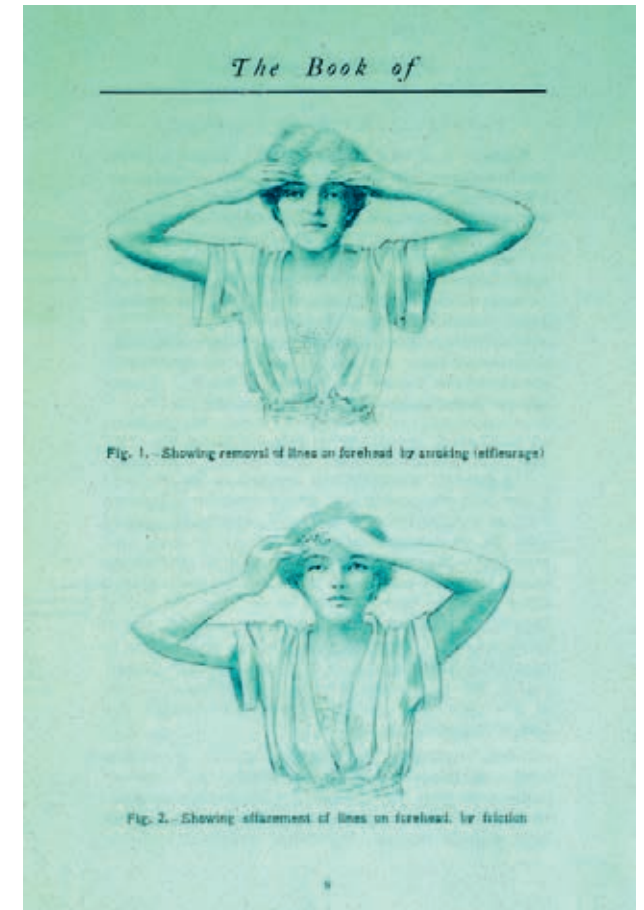
Search    'established a gap'

Result    Copy of Roman dental bridge, Europe, 1901–30

Source    Wellcome Collection online collections



The Book of

Fig. 1.—Showing removal of lines on forehead by stroking (effleurage)

Fig. 2.—Showing effacement of lines on forehead by friction

Sandra L. López Varela

Page 153

'These purpose-driven generations are challenging us to create value from culture and heritage, through innovation and engagement, for the benefit of wider society.'

Search    'generations, value, culture'

Result    *The Book of Beauty Culture*, 1914

Source    The Wellcome Collection online collections

Wim Pijbes

Page 160   '... internal resistance came from the worry that if you put all of the museum's content online, nobody would come to the museum.'

Search   'internal resistance'

Result   *Modieus geklede vrouw op straat*, New York City
International News Photos, *c*.1930

Source   Rijksstudio

Wim Pijbes

Page 161   '... we reject the top-down mentality that the museum, the curator or the director are responsible for choosing what is important to be shown.'
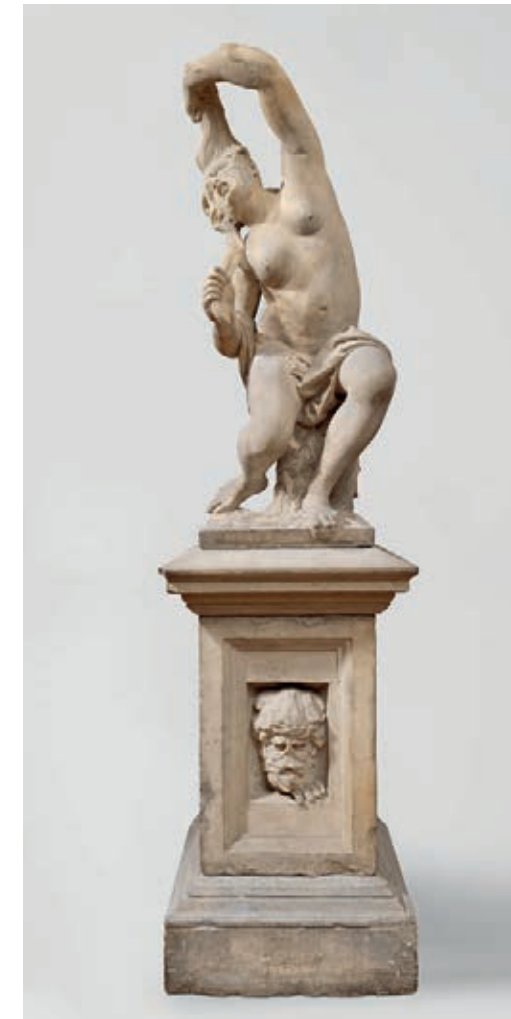
Search   'mentality, museum'

Result   *Frenzy*
Attributed to Artus Quellinus, *c*.1660

Source   Rijksstudio

Loic Tallon

Page 170    'Well, let's get the highest quality images
            out there. Let's give the artwork the best
            chance to speak for itself.'

Search      'let's give the artwork the best chance to speak for itself'

Result      Quilt, Tumbling Blocks with Signatures pattern
            Adeline Harris Sears, begun 1856

Source      The Met online collections

Loic Tallon

Page 169    'This is a collection which you can use,
            be inspired by, study, remix, create, design,
            do what you want to do, and we're not
            placing limits on it.'

Search      'study, remix, create, design'

Result      *Studies for the Libyan Sibyl*
            Michelangelo Buonarroti, 1510–11

Source      The Met online collections
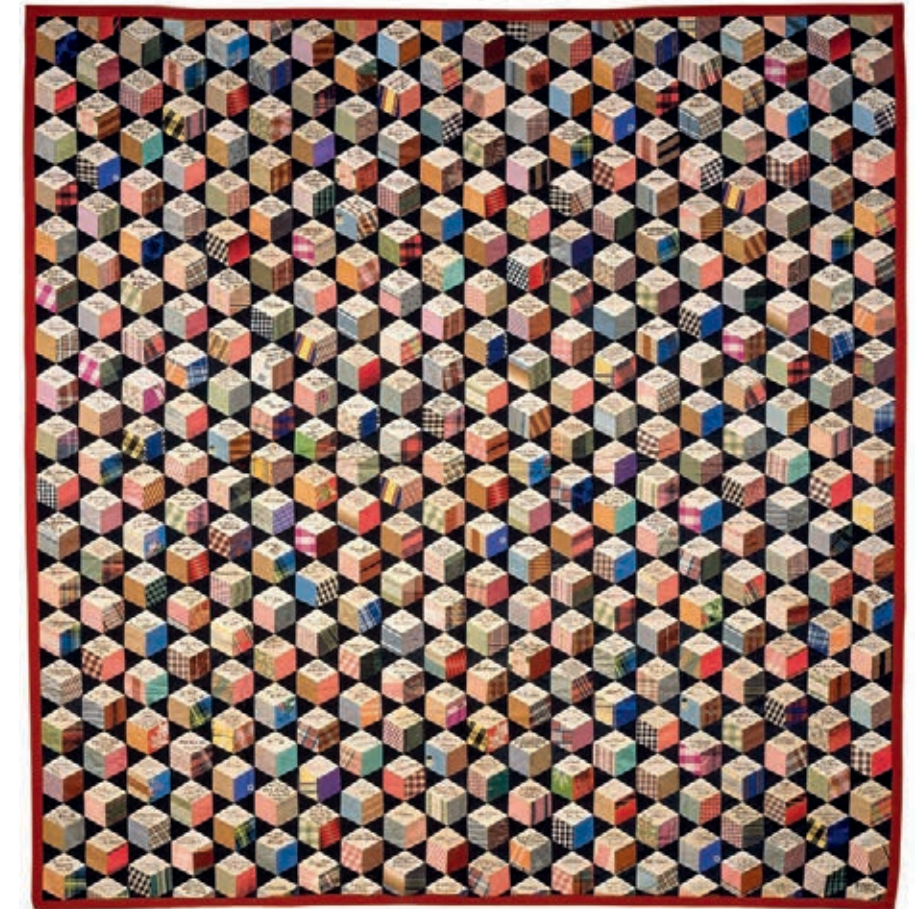
# Remarks on Museums in Copyright

# Abraham Drassinower

A museum must serve a broader public, and a museum must obey the law; two sensible mandates, seemingly without conflict. After all, few museums have been driven to commit murder in the name of the public. Where conflict does arise, however, is in the museum's increasing drive to disseminate its collection online, with the copyright laws that serve to protect the authors of the works in the same collection. Abraham Drassinower, through his study of Canadian law, draws a link between the spaces of exception that copyright law provides, and legal definitions of a museum, to explore the possibility that digitized copies can be lawfully used to serve the public.

To talk about 'museums in copyright' is not to talk about museums *per se*, as institutions or sets of practices in their own terms, or appreciated from their own point of view, but rather about museums as they appear *in* copyright, from the point of view of copyright. The topic is of course vast and complex. It is not only the case that defining a 'museum' is not an easy task, whether in or beyond copyright. It is also the case that 'copyright' is by no means easy to define. Not only are there different copyright traditions, but within each discrete tradition there are different jurisdictions, each of which may frame the relation between museums and copyright differently, or perhaps not frame the issue explicitly at all. Indeed, not all copyright jurisdictions have provisions explicitly mentioning museums, and those that do, do not necessarily have the same provisions.

The diversity of positions and experiences is engaging. It suggests, perhaps somewhat counter-intuitively, that if one were to grapple with a single jurisdiction in some detail, one might be able to formulate, even if in a preliminary way, some general propositions about how museums arise in copyright law *as such*. While different jurisdictions deal with the question of museums in copyright differently, it does not seem far-fetched to suppose that they must all in some way or another deal with the same question. Does that question have a structure? Is there a set of considerations that both motivate the question and, to some extent at least, determine its answer?

I teach copyright at the University of Toronto Faculty of Law, in Canada. Thus, it was not difficult for me to decide what particular jurisdiction I would look at in search of more general propositions. Clearly, readers of this book will come from all over the world, but the case of Canadian copyright is useful to reflect on generally. Indeed, there are three features of the Canadian copyright museum regime that make it especially interesting, and therefore suitable, I hope, to seize as a starting point for reflection into the problem of museums in copyright. The three features are: (1) Canadian copyright law explicitly grants museums certain exceptions from the ordinary operations of copyright law; that is, museums occupy a special place in Canadian copyright law;[1] (2) the Canadian Copyright Act explicitly defines the word 'museum';[2] (3) the Canadian Supreme Court has been recently preoccupied with developing the very concept of an 'exception' in copyright law in fruitful directions.[3]

COPYRIGHT EXCEPTIONS

I want, first, to provide a quick précis of what copyright is in the most general of senses. Second, I want to touch briefly on what an 'exception' is, and more specifically on what a *copyright* exception is. And I want, third, to describe a single provision in the Canadian copyright museum regime, by no means an unusual provision, in the hope of bringing into relief the role of the definition of 'museum' in the determination of the scope of the exceptions or prerogatives granted to museums under Canadian copyright law.

Generally speaking, copyright is an exclusive right to copy. It is a right held by a person to prevent others from copying. We might say that she who holds a copyright holds a right to prevent others from repeating something, from making it happen again. This something, however, is not just anything. It is what copyright law calls a *work of authorship*. For example, copyright law does not grant exclusive rights of reproduction in respect of mousetraps. Of course, you could get yourself a copyright in respect of a painting of a mousetrap, or a photograph of a mousetrap, or a poem or even a play about a mousetrap. But the mousetrap itself, considered as a contraption or device to catch mice, is an invention, and as such within the province of the law of patent. Copyright grants rights of reproduction not in respect of any and all products of the human mind, but only in respect of works of authorship – such as, for example, musical, literary, dramatic or artistic works. The law of copyright is a law about authors, not inventors.

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As soon as we see that copyright protects works of authorship, but not just any product of the human mind, we also see that copyright must distinguish between those products it protects and those it does not. It must have a threshold doctrine, a way of determining when copyright is to be granted or refused. This is the doctrine of *originality*. To claim successfully that a given product of the human mind is subject to copyright protection it must be shown that the product is an *original* work of authorship. Ordinary phone directories, that is, alphabetically arranged white pages, are the dated yet classic example of what copyright does not protect. The collection of information and its mechanical arrangement following a predetermined pattern (i.e. alphabetical listings of names and phone numbers) is not original for copyright purposes. To be sure, producing a phone directory can be costly, but the fact that it is costly does not make a directory an original work of authorship. It does not attract copyright protection by virtue of being costly. From a copyright perspective, unoriginal yet valuable products of the human mind or of human labour can be copied with impunity. Copyright is not about value, but about authorship. Of course, this does not mean that works of authorship have no value. It means only that it is not by virtue of having value that they are subject to copyright.

Thus, originality is the passport, so to speak, that copyright requires before it grants entry into its territory. It is the threshold doctrine that differentiates

copyrightable from non-copyrightable subject matter. It defines the specificity of copyright subject matter. 'Not all copying is … copyright infringement.'[4] That is a famous line from a classic American copyright case about phone directories, in which the American Supreme Court unequivocally established the proposition that copyright protects authorship, not just labour or value of an indistinct kind. Only copying of an original work of authorship, not any and all copying, can give rise to copyright infringement.

But note that, even after we have passed the threshold into copyright territory, it remains true that not all copying is copyright infringement. To say that a play is protected by copyright is not to say that one cannot copy from it. To begin with, copyright protects only a substantial part of a work, so that insubstantial copying does not give rise to liability. But more interestingly, copyright does not protect ideas. If I were to write a play about star-crossed lovers, and, upon reading it, you were to find yourself so very inspired that you went off to write your own play about star-crossed lovers, I would have no recourse against your copying the idea expressed in my play, even if, let us assume, I was the first ever to write a play about that topic or even the first ever to come up with such an idea. Copyright protects expression, not idea. It protects the way a topic is conveyed, but not the topic itself. This is the *idea/expression dichotomy*. It is a dichotomy of protection. It affirms the author's exclusive right to prevent others from copying her expression in the very same breath in which it affirms the public's right to copy ideas without permission. Ideas are 'free as the air to common use.'[5] Unauthorized lawful copying is thus part and parcel of copyright law.

*Fair dealing*, the Canadian iteration of what in the US is known as fair use, is another fundamental instance where copyright doctrine affirms the central concept of unauthorized lawful copying. Fair dealing affirms situations and circumstances in which copying not only of idea but also of expression is lawful. So, for example, in the case of fair dealing for the purpose of criticism or review, author B can indeed copy a substantial part of author A's work, provided that the dealing is fair. What matters here is not so much the precise way in which this fairness is defined, developed or refined. What matters is that once again we see an instance, and here in respect of the very core of original expression, in which not all copying is copyright infringement.

Thus, even a cursory glance at those fundamental doctrines is sufficient to challenge any unreflective impression that copyright law is a prohibition against copying. It is not. Rather, copyright law is an institutionalized distinction between lawful and unlawful copying. This means that (a) not all copying is copyright infringement; and that (b) lawful copying is constitutive of copyright law. Copyright

tells us not only when we cannot, but also when we can indeed copy lawfully in the absence of permission.

The concept of lawful yet unauthorized copying is central to the way in which the Supreme Court of Canada, in a landmark case in 2004, formulated the nature of a copyright 'exception'. An exception is what is out of the ordinary. An exception denotes a situation in which a general rule does not apply. In this vein, until 2004, the fair dealing provisions in the Canadian Copyright Act were known as 'exceptions'. Because they stipulate situations in which expression can be lawfully copied, they were understood to stipulate exceptions to the general rule that copying of expression is unlawful. The Supreme Court of Canada took issue with the terminology. It said that so-called exceptions are best described rather as 'user's rights', as affirmations of lawful copying as part and parcel of the copyright system.

A great deal follows from that terminological shift. Once the court formulates exceptions rather as user's rights, it tells us that these user's rights are integral to copyright law conceived as a juridical order or system. We are accustomed to think of copyright as some entitlement held by an author, a right in respect of her work she asserts against others. Copyright, though, is also the system of which both authors and users are equally integral parts. It is a *balance* between authors and users, creators and public. Thus, the Court teaches that, in order to ensure that the balance is correctly considered and applied, we must skirt the language of exceptions and adopt the language of user's rights. More importantly, we must give up the idea that user's rights are to be narrowly interpreted. The narrow interpretation of user's rights is a vestige from the world and language of exceptions, an author-centric world in which users lurk only in the periphery. If we understand copyright correctly, what we will see at its core is not just the author, but instead the relation between creator and public, author and audience – in other words, the balance we call copyright. Users are not second-class citizens in copyright territory.

THE MUSEUM AS A SPACE OF EXCEPTION

It will come as no surprise at this point that the museum provisions in the Canadian Copyright Act are, along these lines, to be conceived not as mere exceptions but rather as user's rights. In 2004 the Canadian Supreme Court deployed the concepts of balance and of user's rights to broaden significantly the fair dealing provisions in the Copyright Act. We have no such judicial decisions specifically on the museum provisions, and in any case, there can be little doubt

that the museum provisions are far more difficult to interpret as expansively as the fair dealing provisions. Still, what interests me here is the structure of the reasoning deployed by the Canadian Supreme Court in 2004. The basic thought it formulated is, in my view, actually a rather traditional one, perhaps even a prosaic one, and that is that the purpose of copyright law is not only to reward authors but also to integrate publics, not only to focus on creation but also to focus on dissemination, not only to recognize speakers but also to affirm dialogue.

Is there perhaps a way in which museums can be understood from a copyright point of view as part and parcel of copyright, perhaps as points of intersection or intermediation between authors and publics? Consider, for example, a most basic of prerogatives granted to museums under Canadian copyright law. Where 'necessary for restoration', museums can, in the absence of permission by the copyright holder, lawfully copy works of authorship in their permanent collection.[6] This prerogative to perform otherwise unlawful copying is granted to museums in a section of the Canadian Copyright Act entitled 'Management and Maintenance of Collection'. Of course, it is only natural to assume that the museum's (user's) right to copy is about making sure that the collection is managed and maintained. We might say that, by granting the museum freedom to copy, the user's right prevents copyright law from operating contrary to the requirements of management and maintenance of the collection. But that is in fact *not* what the user's right is about. It is not about the collection *per se*. For example, if I personally owned a collection of works of authorship that I kept in my garage, and that collection (or some of its items) were in urgent need of restoration, it would be an infringement of the copyright therein for me to copy it without authorization, even if such copying was for the purpose of maintenance or restoration. Or, to be more precise, if it were the case that I had a right to copy my private collection for restoration purposes, that right would not and could not be premised on my status as a museum – precisely because, as private, my collection neither is nor could be a museum. Similarly, if a museum were to sell to a private collector an item urgently in need of restoration, neither the museum nor the private collector would have a right to copy it for restoration purposes in the absence of authorization from the copyright holder. The museum's user's right to copy the item would dissolve at the very moment that sale of the item removes it from the museum's collection. In short, the museum's user's right is not about restoring the collection *per se* but about restoring the *museum's* collection.

What is it about the museum, then, that generates the user's right? What accounts for the museum's special status? Or, more simply put, what makes a museum a museum? The Canadian Copyright Act defines a museum as a non-profit 'institution ... in which is held and maintained a collection of documents

and other materials that is open to the public or to researchers.'[7] The definition highlights a museum's special relationship both to the public and to knowledge (i.e. research). It is only as open to either public or knowledge that an institution housing a collection of works of authorship can avail itself of the prerogatives to copy granted to museums in the Canadian Copyright Act. A museum open to researchers but not to the public is, of course, conceivable, but I want to focus exclusively on the aspect of the definition that identifies a museum as open to the public. The clearest implication of that aspect of the definition is that, from a copyright law standpoint, there is no such thing as a publicly inaccessible museum. What makes a museum a museum is not that it houses a collection of works of authorship but that the collection is open to the public. A museum is not a physical space containing physical items, but an 'institution' or set of practices addressing the public in and through works of authorship. As a copyright law matter, the maintenance and preservation of a museum collection is irreducibly the maintenance and preservation of the collection's public accessibility. The museum enjoys special prerogatives because it is by definition in the public's eye.

## THE MUSEUM AS AN AGENT OF THE PUBLIC

Two related observations arise in the wake of the museum's public significance. The first is that, just as a museum is not a physical space, so is a museum collection not a collection of things or physical items. It is rather a collection of works of authorship; that is, a collection of discourses or communications to be seen, heard, understood, responded to and enjoyed by the public.[8] As an institutionalized practice, a museum is a nexus or linking of works and addressees, speakers and audiences, authors and publics. Second, the juridical legitimacy of the museum's user's rights in respect of the works of authorship in its collection is predicated on the status of the collection as open to the public. The museum's right is mediated in and through public access. The museum's right derives from that access. The museum has no rights of its own. It has constituents. It is, so to speak, the public's agent. The Copyright Act authorizes the museum to copy *on the public's behalf*.

The proper conceptual frame for the problem of museums in copyright, then, is not on copying *per se* but on copying as an aspect of the mandate of the museum conceived and defined as a set of communicative practices addressed to the public. The museum's right to copy is the obverse of its duty to maintain and manage the collection as a publicly accessible collection. Strictly speaking, the collection belongs not to the museum but to the public. The museum is an 'institution' in which the public's collection is 'held and maintained.'[9] The heritage

the museum holds is common. More precisely, the museum holds the collection *as* common heritage, and it is only when it does so that it can be said to be a museum at all.

Does this focus on the statutory definition of the museum as open to the public exert any pressure on the scope of a museum's prerogatives under copyright law? My sense is that it does, and that it must. One quick way to access the issue is to note that the meaning of 'open to the public' is neither self-evident nor static. In a digital and increasingly digitized cultural environment, the meaning of 'open to the public' can hardly be reduced, as it were by definitional fiat, to the analogue environment. In the Internet's world, the prerogative to digitize a collection for public access purposes cannot help but suggest itself as an incident of the museum's nature as open to the public. The Internet's public is no longer a public for which attendance to a particular (physical) site is the default or self-evident option to access or engage with common heritage. The museum as a physical location is by no means the sovereign paradigm of institutionalized practices mandated to link speakers and audiences, authors and publics.

A museum's user's right to copy for restoration purposes is not a right pertaining to a physical object. Rather, the right pertains to the public accessibility of a communicative act posited thereby as common heritage. In this sense, the museum's right to copy is the obverse of its duty to give the public its due. In the same vein, a museum as a matter of copyright law (i.e. a museum *in* copyright) is not a physical location or building housing physical objects, but rather an institutionalized practice linking speakers and publics. A museum is a linking in the sense that it holds, manages and maintains common heritage both as common and as heritage. Certainly in respect of the Internet's public, then, the failure to grant a museum the prerogative to digitize its collection is inconsistent with the affirmation and recognition under copyright law of the museum's mandate as an institution open to the public. The reasons to allow digitization are, I believe, the very same reasons for which restoration has already been granted. In a word, if a museum may restore, it may also digitize in the public's name.

# Cultural Heritage and the Digital Divide

# Sandra L. López Varela

While museums and cultural organizations focus their efforts on sharing digitized heritage online, a glaring gap emerges: over half of the world still has no access to the Internet. Furthermore, youth around the world are using the Internet in ways which are fundamentally incompatible with the design of many collections-based websites. Sandra López Varela argues that if the heritage community wants to take global access seriously, they will need to adapt to the changing landscape of how the Internet is being used, and by whom.

The Internet is a fundamental part of daily life, delivering massive economic and social benefits around the world, according to the 2018 World Economic Forum. Yet 54.1% of the world's population,[1] estimated at 7.6 billion people,[2] has no access to the Internet. The Internet, the enabler of the Fourth Industrial Revolution, aims for the transformation of societies and economies through the power of knowledge. Internet connectivity has influenced museums worldwide to use digital technology to reproduce their archived collections in cyberspace and to provide wider public access. While there has been a noticeable rise in the percentage of people using the Internet in emerging economies, these nations lag behind developed nations. The existing digital divide challenges the desire to make these collections accessible to the whole world, given the social and economic intricacies of the information age.

## THE AIMS OF DIGITAL ECONOMICS

Information and Communication Technologies (ICT) have the power to transform economies and societies. However, the universality of this premise is questionable, as economic differences worldwide have established a gap, a digital divide, which has slowed down the appropriation of our belief that we can create a better world by sharing knowledge and information through ICT. Indeed, ICT has transformed our ways of life by connecting us to the world through the Internet, and by providing the possibility of sharing our knowledge and information through the World Wide Web. The idea behind the introduction of ICT worldwide is to create 'knowledge societies' that can contribute to economic growth.[3]

We should go back to 1949 to understand knowledge as a proxy for economic growth. During his second inaugural speech as President of the United States, Harry Truman outlined a programme to overcome poverty worldwide by inviting underdeveloped nations to industrialize their economies, which would require the creation of a skillful, technologized workforce.[4] From the World Bank to the OECD, institutions today continue to believe that technology will bring citizens in 'threshold countries' – countries committed to undertake any necessary steps to improve their welfare standards – better employment opportunities, and with them, a better income, ending their poverty. Almost 70 years after Truman's speech, threshold countries – and indeed developing countries – have not been able to eradicate poverty and inequality through technology. By encouraging the improvement of macroeconomic variables – for instance, GDP, unemployment rate or inflation rate – these countries have improved their information and communication infrastructure, showing to the world their economic progress and success. Yet in making this a priority, governments have slowed down the growth

rate of social development. Therefore, a significant percentage of their citizens continue to live in poverty, without full access to the Fourth Industrial Revolution.

The benefits of the Internet are still unavailable to over half of the world's population, according to the 'Measuring the Information Society Report' by the International Telecommunication Union (ITU), the United Nations specialized agency for information and communication technologies.[5] For those institutions aiming to become world leaders in the promotion of culture or the arts by unlocking the value of their collections – through digitizing them and allowing open access via their webpages – facing this reality is of ultimate importance. In the face of this economic imbalance, it is essential to understand who is connected to the Internet and what is of interest to its users.

## PROFILING ACCESS TO THE INTERNET

The world's population is estimated at 7.6 billion people.[6] Globally, 3.9 billion people do not have access to the Internet, of which 81% are in developing countries, according to the ITU.[7] This offline population is disproportionately illiterate, female, elderly, less educated, lower income and rural. Although the number of Internet users has reached 3.6 billion people, almost 2.6 billion of those live in developed countries, according to ITU's latest 2018 report. Countries topping the ICT Development Index (IDI) –a composite index combining 11 indicators into one benchmark measure, used to monitor and compare developments in information and communication technology between countries and over time – include the Republic of Korea, China, and Japan, followed by seven European countries. The United States does not rank within the 10 countries with the highest IDI index. In the light of this, the goal of transforming economies and societies through ICT may only reach half of the world's population. Therefore, it is important to analyze who uses the Internet, where, and how.

## THE DIGITAL DIVIDE

The answer to the question of who is connected to the Internet is similar around the world: those with the economic potential to do so, that have basic digital and literacy skills, and, crucially, English language literacy, given that most content is reproduced in this language. There are significant differences in the levels of Internet adoption by different groups within society,[8] influenced by age groups and gender. The latest 'ICT Facts and Figures' show 70% of the world's youth aged 15–24 are online.[9] The Americas is the only region where a higher

proportion of women than men are using the Internet. However, this tendency is related to those countries in the Americas that score highly in tertiary education and gender parity. <u>Differences in levels of education and school enrolment worldwide are important factors in Internet use.</u> Gender imbalance in access to education explains why more men than women use the Internet worldwide.

There is a strong link between Internet use and geographical place of residence, urban against rural. In developed countries, 'Home' remains the place where people most frequently use the Internet.[10] Still, only 52.2% of households around the world have access to the Internet, mostly in developed countries (83.8%). Data from Eurostat shows that over 90% of individuals living in high-income households use the Internet.[11] In a threshold country, such as Mexico, only 47% of Mexican households have access to the Internet. Why? Because the other half that is living in poverty cannot afford to have a computer at home or pay for Internet services. Therefore, in countries with lower income levels, schools and universities remain important Internet access locations, along with commercial facilities.

As a result of the expansion of mobile networks and falling prices, mobile technology has now become the second most common way of accessing the Internet worldwide. The ITU reports that there are almost as many mobile-cellular subscriptions as people on earth.[12] Still, many people do not own or use a mobile phone. Close to 20% of the population living in developing countries are still not using a mobile phone. People living in rural areas of these countries are less likely to own or use a mobile phone than people in urban areas. Although basic mobile infrastructure is available in rural areas worldwide, affordability is the main barrier to mobile phone ownership, as well as the perceived lack of benefits, while others cite a lack of technological skills. There is a significant gender gap in mobile phone adoption associated with differences in income and education attainment.

Location and the type of device used to access the Internet determine what people are accessing worldwide. Those accessing the Internet on a computer spend most of the time getting information through online portals, and consulting business and finance websites, as well as entertainment and news sites. Smartphone users spend most of the time sharing photos, using maps, and on gaming and social networks. Internet users with higher levels of education make greater use of more advanced services, such as e-commerce and online financial and government services. Internet users with lower levels of education and income, distributed mostly throughout developing countries, use the Internet predominantly for communication and entertainment purposes through the consumption of audiovisual content. This suggests that many people do not benefit fully from the opportunities of the Internet.

## HOW OLD IS THE POPULATION USING THE INTERNET AND MOBILE TECHNOLOGIES?

In developed countries, 94% of young people aged 15–24 use the Internet compared with 67% in developing countries.[13] Of the 830 million young people who are online, 320 million (39%) live in China and India.[14] Fundamentally, the Internet user is either a Millennial, between 20 and 33 years of age, or a Centennial, between 14 and 19 years of age. These generations are interested in checking email, use social media to keep up with what friends are doing, stream music and movies, shop and play games. Given that by 2020, Millennials will make up 35% of the global workforce, some taking leadership positions, organizations can no longer ignore their needs. These generations, connected to the Internet, are thinking outside the box and are finding innovative ways to replace outdated models. Both generations, according to the Deloitte Millennial Survey 2017,[15] are transforming the culture of organizations, not only because they are tech-savvy, and are on social media, but because they are on a mission. According to the same survey, these generations are first and foremost driven by working on projects which make a difference – whether that be social, environmental, scientific or technological. Millennials are expecting organizations to have the technology to innovate and collaborate. <u>These purpose-driven generations are challenging us to create value from culture and heritage, through innovation and engagement, for the benefit of wider society.</u>

To effectively reach these generations, which represent 70% of Internet users worldwide,[16] cultural institutions and museums need to reconsider their display of content using the Web 1.0 format based on hyperlinks and texts. Museums around the world have designed online catalogues for the user to visualize an object through a high-resolution photograph and to read a brief description of the object. Even if the website allows access to social media, it does not encourage interaction with the digital community, hence the low number of followers on a typical museum's Facebook page.[17] Museums are providing a static view of their collections to an interactive generation.

## MOVING FROM A WEB 1.0 TO A WEB 2.0 FORMAT

Those connected to the Internet are looking for an engaging experience online. The user wants to encounter texts which are both enriching and capable of producing new content. This means moving away from viewing the Internet as a platform for publishing information to one that promotes communication via different tools, such as blogs, media content upload, social networking sites,

'tagging' (allowing users to label websites, videos or photos), 'like' buttons (which enable a user to indicate that they are pleased by online content) and social bookmarking. In other words, websites need to become places where the user learns and develops emotionally invested ways of caring for our culture and heritage. It involves a transition to a Web 2.0 format, that is, to the Social Web.

Moving to a Web 2.0 format is so much more than creating digital archives and reproductions from analogue resources or from digitally created resources, as suggested by UNESCO's Charter on the Preservation of Digital Heritage back in 2003. It is about analyzing the institutional context in which contents are developed. It is about transforming the museum into *a place of cultural negotiation*; where the virtual museum becomes a living organism, linking people, visions, interpretations and values related to a specific environmental setting, as suggested by Giaccardi and Palen.[18]

Beyond the fact that moving to a Web 2.0 format will be a prohibitively economic endeavour for many countries, the transition requires the democratization of knowledge, in ways that may contradict current institutional practices and legislations. Principles behind Web 2.0 lead to social inclusion in the building of content, empowering local communities. Increasingly, projects such as 'Silence of the Lands', an initiative by the University of Colorado, promote a model for the preservation and experience of culture, empowering local communities in the process of interpretation of the cultural object. 'Silence of the Lands' engages local communities to collaboratively create and explore the soundscape of a natural park or protected area. The 'Virtual Museum of Collective Memory' of Lombardy, Italy, collects images and stories related to historical events and the everyday life of Lombardia people, and transforms the local community in a kind of active process of heritage-making. The project, conducted by Elisa Giaccardi, uses both the web and the radio to promote storytelling and personal accounts. 'México Alternativo', a project conducted by Sandra López Varela, promotes a collaborative relationship with the public by recording people's heritage through a mobile application, teaching us that cultural heritage is more than an object or a monument giving us aesthetic pleasure.

THE FUTURE DIGITAL LANDSCAPE

Embracing alternative views of what heritage and art mean to society may be difficult for first generation museums and cultural institutions to accept. However, the changing digital landscape is leading to an increasingly collaborative relationship with the public. Their voices are demonstrating there is more to

reproduce through museums' websites, alternative expressions that have lasting value and significance and that are also unique expressions of human knowledge. The future of the digital landscape consists not just in moving to a Web 3.0 format – a smarter web, which through semantics and artificial intelligence knows what content you want to see and how you want to see it, saving you time and improving quality of life. The future rests in a capacity to promote new forms of solidarity in the generation of knowledge, through inclusive partnerships, built upon shared values and goals.

01
In Mexico, even in remote rural areas such as Cuentepec, Internet access is offered at their local stores.


02

02
Common to any major city in Japan, such as Tokyo, young people are prolific mobile phone users, using them while on the go in the city.

03
In China, the digital divide is very evident, as telephone booths are still a common trait around the country.
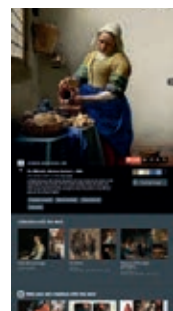

01


03

# Making the Rijksstudio

# An interview with
# Wim Pijbes

In 2012, the Rijksmuseum in Amsterdam became pioneers in open access when they debuted Rijksstudio, a website that allows users to easily search their collection and download high-resolution images without any restriction. Wim Pijbes, the former museum Director who oversaw the initiative, discusses here the pragmatism and value-based decision-making that went into the project, and why the proliferation of copies is the best propaganda for museums.

**Anaïs Aguerre** What would be really interesting is to go back to how this idea of open access emerged at the museum. I believe the museum was closed at the time but you still had the ambition of keeping people engaged. Could you tell us about how the fact that the actual museum was closed helped push this digital agenda forward?

**Wim Pijbes**

Well, a few things came up at the same time. Yes, the museum building was closed for major renovations, and from the beginning there was the idea that the curators should really concentrate on the collection during this period, making books about the collection and working on cataloguing the objects, because finally there was time to do so. The museum was first closed in 2003, and I stepped in in 2008. During that period, from 2003 to 2008, the Internet was becoming increasingly important. So at a certain point, we decided to step forward and really make a big move into the digital world. In 2012, we debuted Rijksstudio on our website, where we made freely available high-resolution images of 125,000 works from our collection. We made the site easy to search, so you could compare different pieces based on a keyword, and we encouraged people to use the content in any way they saw fit.

**AA** Brilliant. That was quite early on and pioneering at the time. Was there resistance? What sort of barriers did you encounter?

**WP**

Yes, internally and also from the outside there was resistance. The internal resistance came from the worry that if you put all of the museum's content online, nobody would come to the museum. I always said, 'Well, the authentic object is always unbeatable. Nothing can compete with the real thing, so seeing a digital image online will just make you even hungrier. If you see the imagery online at the best quality, then sooner or later you want to see the real thing.' However, that was a bluff at the time. I was not really sure that that would be the case. But now we can see that's what's happening. Technology keeps on advancing, virtual reality is going to become something significant, but regardless,s there's still only one authentic object, and museums have it.

**Brendan Cormier** The question I've been asked a lot from other people is: don't you think that the vast proliferation of copies, through reproduced digital and physical images, will somehow reduce the value of looking at the original?

**WP** No, it's exactly the opposite. It's simply not true. Walter Benjamin's classic theory is that in the age of copies the original becomes more and more valuable, because a copy is always a copy. What Walter Benjamin describes as the aura – the copy does not have the aura of the original and that makes the difference. The copy has not been made by the artist.

**AA** As evidence of that, with your big push to publish online content, people were still very excited about the re-opening of the museum, to see the real objects. So that might prove your point.

**WP** I think publishing online helped to make the imagery more popular than it already was, in high quality, to all the corners of the world. So yes, that really helped to make us more popular.

**BC** Have you noticed people discovering more obscure content from the collection now that it's online, and now that they can type in different search queries? For example, there's a colour that's really popular right now, 'millennial pink'. It's the most popular colour that shows up on Instagram. So then you start to see various bits of pink architecture featured in fashion photo shoots or music videos. I imagine art directors simply doing a Google search for 'pink buildings', and all of sudden there are these overlooked buildings thrust into the limelight.

**WP** No, I haven't noticed it yet. But I think it's a serious proposition, because within seconds, you can see lots and lots of images, and you can make comparisons. You can search based on colour, on size, on artist, on period, whatever, and it's all there. It's much easier on the Web than having ten heavy books, having to open them to a certain page to compare pages.

With the Rijksstudio, we had the idea that everybody can be their own curator. So we reject the top-down mentality that the museum, the curator or the director are responsible for choosing what is important to be shown. You can make your own selection. That's the whole idea of the Internet, in general. It's much more democratic than the old world.

**AA** Yes. I think what has been really striking throughout the ReACH conversations has been this idea that there is this much more democratic approach to owning our cultural heritage and giving people agency to play a role or a part in preserving and interpreting it. There is also this opening up of the creative potential of collections, through people being able to see all these images together on a screen. To change track slightly, when you started the project, what were the other projects at the time that inspired you? What were the benchmarks against which you dreamed your plans?

**WP** The benchmark was not so much in the museum world. Early on, the project was adopted by Google as one of their so-called 'darling' projects. So we were looking to technology companies rather than other musuems.

BC    Was this the Google Cultural Institute?

WP    At that time, the Google Cultural Institute did not exist yet. But yes, it would go on to become that. So we were a very early partner.

AA    How critical was it for the project, and to push that agenda, to be working with Google? Do you think you could have done that without partnering with a key digital player?

WP    No, I think it was really necessary and instrumental to work with Google because they have the knowledge and they already knew what the direction of the Internet was, and in anticipating that, they could really help us in establishing this whole Rijksstudio instrument.

BC    Let's talk about licensing. You made the decision to release high-resolution images from your website, completely licence-free. A lot of museums can buy into the open-access argument up until the point of commercial use, because that's a stream of revenue. You've made it very clear in the past that that was simply a choice the museum had to make. You looked at the numbers, how much money you were making from licensing, and looked at the beneifts of complete open access, and chose the latter. You showed us wonderful examples where Rijksmuseum collection images were showing up on milk cartons, or in the airport, which I presume you interpret as free advertising for the museum.

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WP    Yes, I think the value of all this imagery floating around is that it's the best propaganda – if I may use that word – for the museum and for the collection. The Rijksmuseum, the Louvre, the British Museum, these are all public museums with public collections. So they already are in the public domain. If you agree with that then why not share these treasures with everybody, and that also includes commercial use.

BC    What's your view on 3D digitization, and how museums can share 3D models of their collections?

WP    Well, it's new, but it's the same thing as with two dimensions, we're still talking about a copy. So the arguments I made with 2D still hold true. There is a strong role for 3D in the idea of a virtual museum, the use of virtual reality. You could then reach out and have an even wider audience than before. People from remote parts of the world without the means to travel could visit a virtual version of your museum. But still it is not the real thing. It can come very close to the real thing, but never 100%.

It's a bit like with plaster casts. If I come to the Cast Courts at the V&A, I can see all the major works from the Greek, Roman and Renaissance periods standing next to each other; suddenly you see the connection between all these objects. You can only do that through copies, because the originals are spread throughout the world.

AA    In the cultural sector, do you have a view of which field is more advanced in embracing new technology as a way to fulfil their mission and be relevant?

WP    I think the music industry has really embraced the possibilities of digitization very well. The need and urgency in the music industry was much higher than in the visual world. There was a point where everyone could copy music and share it freely, so the whole business model of the music industry was in crisis. If you were a musician and were only depending on the income from CDs you simply wouldn't survive. So what we saw was a return to live performance again. If a CD is a copy, a performance is the orginal.

AA    I guess that's the point. I think we should concentrate on the authentic experience that we can offer. We need to build a business model around that, rather than focus on how we are going to generate income from licensing images because actually, very soon, we will be facing the same risk as the music industry. We won't be able to control it and therefore that will be a whole business model that will be exposed to things that we can't control.

WP    Yes, exactly. Museums are not in control of technological developments, so the only thing that you can do is keep pace with the digital world, and think about your core business in running a museum and make that more valuable than you already did. I think that's the future.

01
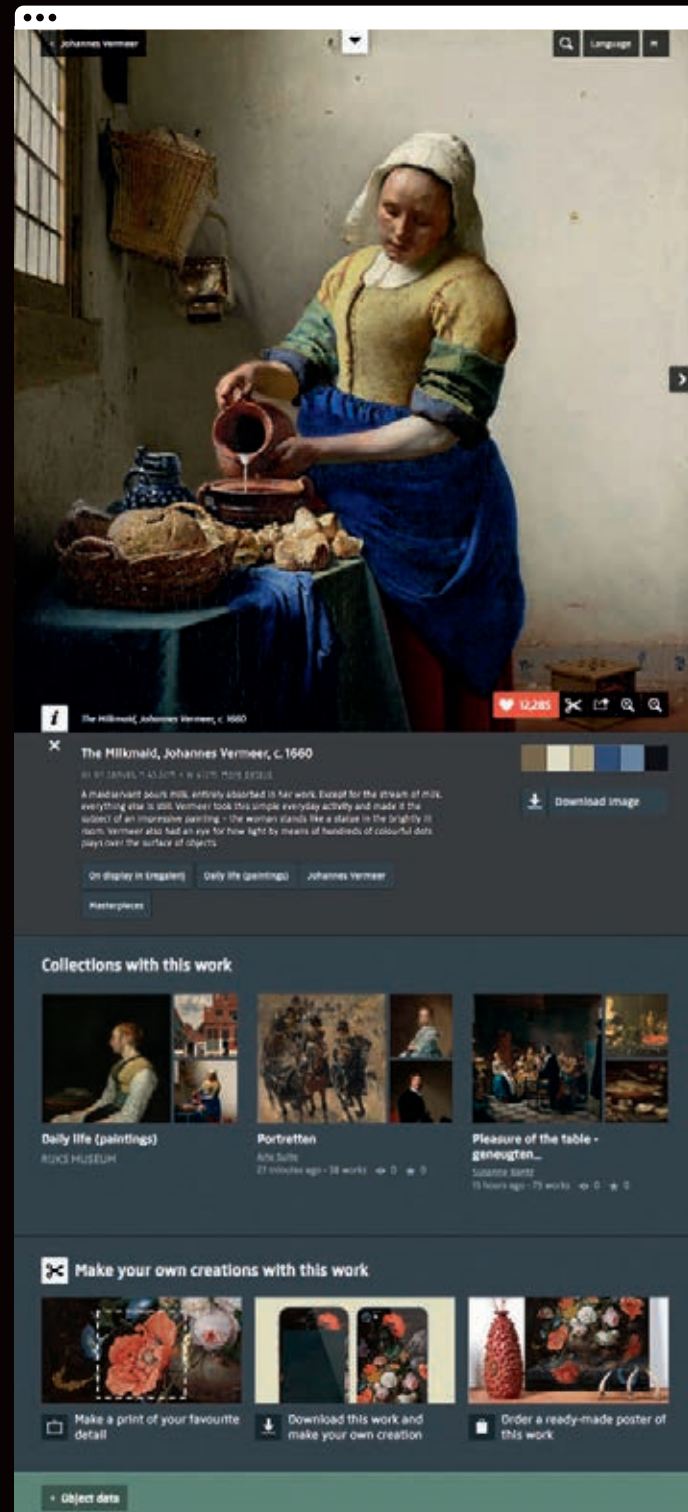
01
Screenshot of the
Rijksstudio interface,
encouraging users to
re-appropriate works
from the Rijksmuseum
collection.
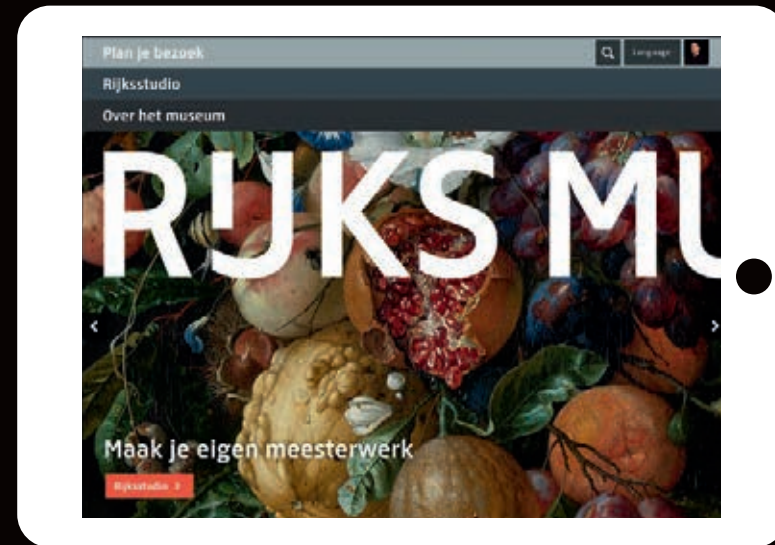


02

02
Design of the Rijksstudio
interface for tablets.

03
Former Rijksmuseum
Director Wim Pijbes with
Roelof Joosten, CEO of
Royal FrieslandCampina,
commemorating the
use of Rijksmuseum
imagery on the company's
package design.

04
Rijksmuseum images being
used on milk cartons.



03



04

# Digital is More than a Website

# An interview with Loic Tallon

Today, a museum's reach is not just measured by how many people visit it, but also by its digital impact: how it presents its knowledge, brand and content online. For many years, the main marker of success has been website clicks: driving traffic to a museum's own website. Another path is now evolving, based around positioning a museum's collection and data online so that it can spread throughout the Internet, landing on sites that people already frequent. Loic Tallon, Chief Digital Officer at The Metropolitan Museum, New York, explains the rollout of this new approach, and how they are connecting the 3.6 billion people online today with the artworks in The Met's collection that are most relevant to them.

Brendan
Cormier

In 2017, The Met announced that it had made images of public domain artworks in its collection freely available online through a Creative Commons Zero Licence. I'm interested to hear how this open-access initiative came about. What prompted The Met to do this?

Loic
Tallon

The Met is always exploring how to increase engagement with the collection in ever more impactful ways. Digitizing and putting our collection online has been a major focus of that work. In 2008, we had around 80 artworks available online; nine years later, we have more than 440,000 artworks catalogued online together with more than 330,000 collections images. About three years, ago we released the collection's images under an OASC licence, which means 'Open Access for Scholarly Content', allowing scholars to access and download digitized content. It was a strong step forward, but users felt that the licence was ambiguous about what did and did not constitute 'scholarly use'. Is a scholar a PhD student, or is it a kid at school doing their art project? Do they also have a right to use the collection? Our feeling was yes, but the licence did not make that explicit.

To take a step back, when I look at the unique collection at The Met – spanning 5,000 years of world history – I believe we have an artwork in the collection that can inspire every single person on the planet. I fundamentally believe that. According to UN figures, there are around 3.6 billion Internet-connected people in the world, and I want to make the distance between each of those people and the artwork that would inspire them as small as possible. That's the goal. To do that, there are some key levers we need to pull. How we license content is one lever, and we'll come back to that. The second lever is getting our collection onto other websites, because not everyone is going to come to metmuseum.org to find it. People don't do this right now. They click on the first or second search result in Google. They probably go to Wikipedia first. Whilst I would love them to come to our website, fighting that battle is incredibly difficult, and would be a questionable return on investment. We welcome around 31 million people to the website each year. That's less than 1% of Internet users, and is orders of magnitude less than sites like Wikipedia, Google and Pinterest. I'm perfectly content if someone first discovers an artwork from The Met without actually knowing it came from The Met. They'll learn the artwork's origins over time, if they're curious. The first step, though, is to put the collection in those locations where people will encounter it, and not say, 'You have to come to the metmuseum.org to discover the collection'. The third lever is that we can make sure that we get our content out in multiple languages, so that it's not a pre-requisite that you understand English in order to engage with the collection. And a fourth lever is to develop robust APIs for our collection, which essentially means formatting The Met's data in a standardized and machine-readable format so that it can be automatically ingested at scale by technology partners.

<span style="color:gray">Page 138</span>

But to get back to the issue of licensing: to get our content onto other platforms, we needed to first address how we license images. This is where we came up with the idea of attributing all our content with a Creative Commons Zero licence (CC0). CC0 is a pre-existing licence developed by the non-profit organization Creative Commons, to denote that an object is in the public domain and people are free to use it as they like. We chose this licence because it was unambiguous, internationally recognizable and an existing standard. We think this licence was the clearest way to say, 'This is a collection which you can use, be inspired by, study, remix, create, design, do what you want to do, and we're not placing limits on it'. It was important that CC0 was an existing licence, because, over time, it is likely that more and more automated systems will just look for a CC0 in an asset's metadata, and if they see CC0, they'll take the content, and if it sees a licence it doesn't understand – say an OASC licence – it won't. So if we want to scale the impact of our collection we need to be using a standard licence that automated systems are programmed to understand.

BC

Was there a specific 'a-ha' moment when you realised that it was better to get your content onto other websites rather than rely solely on your own?

LT

I think it's a conversation the sector has been having for a long time. It comes down to the museum's mission, which at The Met is to 'collect, study, conserve and present significant works of art across all times and cultures in order to connect people to creativity, knowledge and ideas'.

In that mission statement, the one word which fundamentally includes the broader public is the word 'present', as in 'to present significant works of art'. In 1870, when The Met was created, the way to present artwork was predominantly inside a building, and maybe some publications. Now, we have a digital stage as well. I think the 'a-ha' moment was really when the museum understood that success with digital is centred around content engagement and not necessarily visits to the institutional website. It is about users engaging with the collection, no matter where they encounter the collection.

BC

How exactly do you envision people engaging with the museum's collection?

LT

The CC0 licence enables people to use, study, create and remix the images in the collection in any way they feel is inspiring. So it's up to them. They can reference us if they choose to or not. If you want to sell what you've made, you can sell what you've made. There are no commercial imperatives around that either. In terms of what people are currently doing with the collection, we're just scratching the surface. The CC0 licence has now been out for about a year. So far, we've had

people run mass visual recognition algorithms over the entire collection to identify trends, particularly through Google BigQuery. Google BigQuery is a platform for open-access data where you can run algorithms over huge datasets. They've got US weather datasets on there, NASA datasets and so on. Because of our open-access initiative, The Met's collection is now also available as a dataset through BigQuery. By centralizing all this publicly accessible data, it allows people to run algorithmic studies from it. So, as a basic example, you could use BigQuery to write an algorithm that selects artworks from The Met's collection based on weather patterns.

We've seen a few similar creative projects happen so far, where people have created mash-ups or remixes of Met content, which they then share on social media on a regular basis. I think the most inspiring use of the collection, though, is probably what's been happening in the Wikipedia community. In just one year, the use of The Met's collection on Wikipedia has grown by over 300%: it is now seen by over 10 million users a month there. More people experience The Met on Wikipedia than on The Met website.

BC     That's amazing. Do you see it also as something that third-party app developers can use?

LT     Absolutely. I would love for creatives in all the major technology companies to start using the collection as a source of inspiration for their work or in their products.

BC     Let's talk about the commercial aspect then, because that's still the most contentious debate amongst museums. At the moment, many museums tend to take a position where they'll give out digital content for personal use or study, but if somebody wants to commercialize it, they'll charge a licence fee. The Met, the Rijksmuseum and a few other institutions are notable in that they don't charge for commercial use of their content.

LT     Fundamentally, this comes down to The Met's mission, and how we best serve that mission in today's digital world. Yes, we have historically derived revenue from the sale of images, but the question is whether the impact of making it accessible to the entire world – in the clearest way possible – would be of greater impact than the revenue we were deriving from the sale of those images. This was the decision we were balancing at The Met. Added to that, even before we introduced the CC0 licence, people were already using images 'borrowed' from our website. There are also numerous low-quality images of our collection already circulating online, which people feel like they can use. So we simply said, 'Well, let's get the highest quality images out there. Let's give the artwork the best chance to speak for itself'.

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When we went open access we released 147 years of work by cataloguers, photographers, curators and researchers. That's what we made available to the world, and we decided that potential was vastly more impactful than the decision to try and retain the declining revenue stream we were seeing from the sale of image licences.

BC     Well, that's essentially what we heard the former director of the Rijksmuseum, Wim Pijbes, say. He oversaw their move to open access, and he said, 'You simply have to make a value choice'. They did a cost-benefit analysis, comparing revenue made from licensing, with the intangible benefits of releasing the collection, and they chose releasing the collection.

LT     Agreed, the cost-benefit analysis is important, even if the benefits are perceived to be intangible. I believe also that if you put things into the commercial space, it is more likely to be picked up by the many smart and creative people in the world who are looking to create compelling new experiences around rich content. If we can put The Met's collections into their hands, and they create the next power app using Met content, it'll get ingrained in people's psyche, reminding them of the importance of the collection. In the same way that the Mona Lisa became famous when it was stolen a couple of times from the Louvre: people started writing about it saying, 'Where is our Giaconda?' It romanticized it, and really ingrained the artwork into the public's consciousness. So when the Mona Lisa came to The Met in the 1963, there were huge queues outside the museum to see this one painting. We have other artworks that are equally beautiful, but they are not as widely known. It's a completely reasonable value proposition to say, 'Let's enable the commercial sector to work with our collection, and to see their creations as incremental value for The Met'.

BC     You touched on APIs a little bit earlier. You have phrased it as 'a standardized and machine-readable format for your data'. Can you just expand a little on the value of an API?

LT     An API is a way of making your data available in a standardized format. It will have a consistent number of fields and will be consistently located, so you can say to another developer, 'If you go to this location, you'll be able to download the most up-to-date version of The Met's data in this structure at any time'. That's really important: when a developer builds something, they want to be able to access the data in a simple and timely manner. They don't want to have to manually download content where one asset has 'title' and 'author' as its main datasets, and another has 'medium' and 'sculptor'. You need a standardized format for the data in order for it to be used in bulk. Essentially, we're talking about a machine-

readable format. If you get to the point where you have 440,000 digitized objects, as we do, then no human can possibly parse that data manually. We need to think about how our data and content will get seen and how our data will get read by something which is a non-intelligent system, which simply looks for patterns that it recognizes.

BC As someone who has catalogued objects before, I can say this is harder than it sounds. The essential background information of an object doesn't always fall into neat categories.

LT The V&A collection is as expansive as ours, in terms of type of objects. Sometimes the artist is a guilder. Sometimes an object has multiple artists. It has a guilder, a forger and so on. So, it's not as cut and dried as saying the artist is Pablo Picasso. It's complex. That being said, creating consistency is really important, and I do think there needs to be a conversation between curators and data specialists about the value of complete historical accuracy versus creating standardized data formats that cover 99% of the necessary use-cases. Every time we build an inconsistency into our dataset, we make it more difficult to find and create cost for the future.

BC You've said in the past that museums need to 'be ready for new content'. I interpret that as being ready for unknown new technologies and formats, which is something museums always struggle with. It seems just when a museum is coming to grips with one format, for example, mass digitization of scans and photographs of objects, a new format emerges, like 3D scanning and modelling.

LT What's really important is that the medium through which content is conveyed continues to evolve. We've gone from text on a page to 2D in black and white, to 2D colour, to 2D high-res colour; now we're going into 3D scans, photogrammetry, holograms, 360-degree videos, augmented reality, virtual reality and so on. As each new content type evolves, we need to treat it as the next one in a spectrum, and catalogue our work with them in the same way.

3D imaging is just a better way of capturing the likeness of an artwork – exactly as we were trying to do with black-and-white images. We've just got better technologies for it now. We need to take all our learning on how to create fantastic 2D images and bring it to the 3D world. When new things come along, it's very easy to see it as new and forget everything you've learned to date. I've been saying more and more, 'Digital is not sexy'. When something is sexy, your emotions kick in. I once co-wrote a paper that asked: 'If an app is the answer, what is the question?' People love building apps. Getting out of bed and building an app is

fun. Getting out of bed and sorting out your data, on the other hand, is probably less appealing. There's a different spring in your step with the former versus the latter. But I think we now realise that the real spring in your step needs to come with the latter, because the greatest value is in the data. And, in terms of impact, structured data is the game-changer. Getting our data consistent and machine-readable, and as accessible as possible to as many people as possible, is incredibly valuable. It allows us to truly scale our reach and impact. And that comes back to those 3.6 billion people, and reducing the distance between each one of them and the artwork that will inspire them.

# Project Profiles

# Europeana Public Domain Charter

THE HAGUE, THE NETHERLANDS
2008–PRESENT

A digital platform for the
dissemination of cultural heritage.



Europeana is an EU-operated digital platform for the dissemination of cultural heritage, which compiles metadata from the collections of over 3,000 institutions. The idea for the project came from the President of France, Jacques Chirac, in 2005, who expressed in a letter the desire for a virtual library of European culture. Europeana also acts as an advocate for open access to museum collections. In 2010, the organization published its Public Domain Charter, a document which outlines ways in which institutions can contribute to and protect 'public domain' rights, the rights inferred on any work once its copyright has expired.

# #NefertitiHack

BERLIN, GERMANY
2016

An ethical art heist.

A century ago, the famed Nefertiti bust was excavated in Egypt and shipped to Germany. Ever since its public unveiling in Berlin in 1923, many Egyptians have been asking for its return, either temporarily or permanently. Although a detailed digital scan has been created of the bust, it has not been made publicly available. Reacting to this, artists Nora Al-Badri and Jan Nikolai Nelles staged an 'ethical art heist' known as #NefertitiHack, whereby they claim to have secretly scanned the bust using a Kinect Xbox controller. A digital file of the bust has since been freely released by the artists as a torrent under public domain, and thousands of people have downloaded it, recomposing the Nefertiti in various digital and 3D-printed forms.
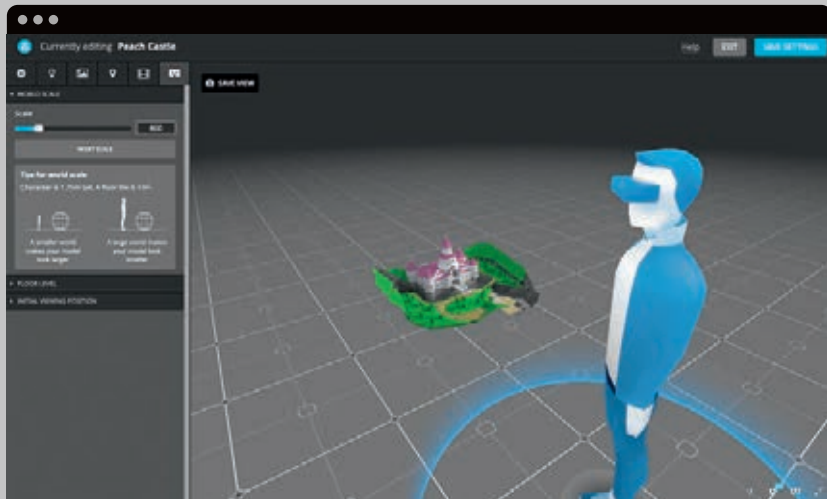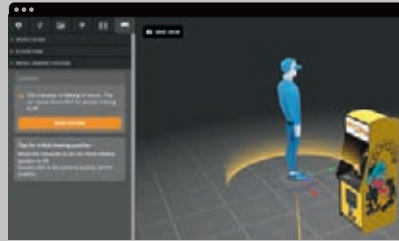




Various projects re-interpreting the Nefertiti bust following the release of the Nefertiti torrent file online.

# Sketchfab

PARIS, FRANCE
2012–PRESENT

An online platform for sharing
digital 3D models.







Sketchfab is an online platform, founded in Paris in 2012 as a
space to upload, share and view digital 3D content. The project
started out of frustration at the lack of online space at the time for
people making 3D models to share their work. By making a website
compatible with all major browsers and VR headsets, Sketchfab
is working to popularize the 3D format, and has quickly grown in
membership to over one million users and two million uploaded
models. Many major museums, including the British Museum, use
the site to host their collection of digital 3D objects.

# Creative Commons

MOUNTAIN VIEW, USA
2001–PRESENT

A system of licences
for sharing content.

Creative Commons is an American non-profit organization founded
in 2001 by Lawrence Lessig, Hal Abelson and Eric Eldred to promote
and better enable the legal sharing of creative works. To do so, the
organization developed copyright licenses which can be used free
of charge, and are meant as a way for artists and makers to easily
communicate the rights that they wish to reserve or waive regarding
the use of their works by other people. Creative Commons provides an
easy-to-use framework for managing copyright, and has most notably
been adopted by Wikipedia with regards to images used on its platform.
In 2017, The Metropolitan Museum, New York adopted a Creative
Commons Zero licence for all of its public domain imagery, which has
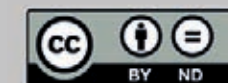allowed the collection to circulate more easily online.



CC BY          CC BY-SA          CC BY-NC-SA

CC BY-ND          CC BY-NC-ND          CC BY-NC

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# USE

The vast potential for digitized cultural heritage has yet to be fully explored. As more and more digital copies and records of cultural heritage circulate online, the fundamental question arises: how should we be using them? It is already clear that they can serve multiple purposes: conservators and academics can dive into high-resolution scans to study microscopic details of a work; curators can use them to create new interactive displays; artists and designers can hack and remix historical objects, inspiring new creations. We can even explore and recreate the different ambient environments in which works might have been historically shown. Understanding better how we want to use digital copies is crucial to understanding how we need to make them. Making, storing, sharing and using digital copies are all contingent on one another.

Merete Sanderhoff

Page 199 'Images, also linguistically, are building blocks
for learning. We are formed by exploring
and creating images.'

Search 'building blocks for learning'

Result Architectural fantasy of the interior of an ancient
building with partially ruined vaults
Robert Adam, 1777

Source Statens Museum for Kunst online collections

Merete Sanderhoff

'... most of the holdings we have are inaccessible to the public most of the time, stowed away in storage rooms and archives'

Search      'most of the holdings we have'

Result      *'The Most Terrible Night.' View of Kongens Nytorv*
            *in Copenhagen During the English Bombardement*
            *of Copenhagen at Night between 4 and 5 September 1807*
            C.A. Lorentzen, 1807–8

Source      Statens Museum for Kunst online collections

'...museums have changed their self-perception to one of hubs for inclusive dialogue and ongoing negotiation of cultural positions and meanings.'

Search      'museums have changed their self-perception'

Result      Udkast til vignet for Dansk Museums Kunstforening
            Joakim Skovgaard, 1913

Source      Statens Museum for Kunst online collections

David Gissen

Page 208  '... the opportunity to understand
the surrounding of an artefact
as something that is constantly
changing, that will change and that
changes artefacts.'

Search        'the opportunity to understand'

Result        Our Lady of Guadalupe
              The A.J. Santero, *c.*1825

Source        The Barnes Foundation online collections

Chance Coughenour

Page 221  'I think digitizing everything and anything,
and keeping it digitally preserved, even if
you don't have a clear idea of how to use it,
is still extremely important.'

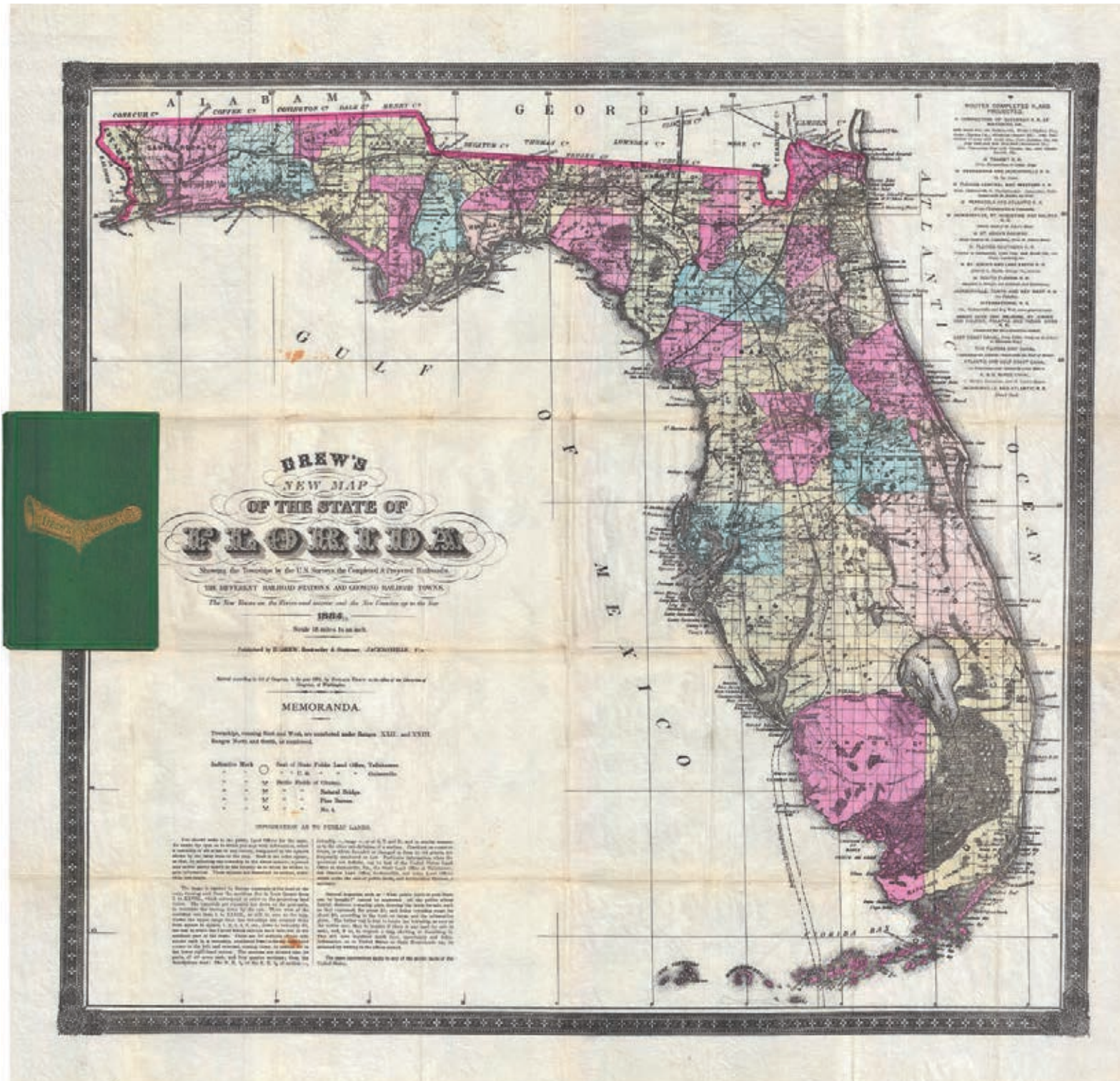Search        'digitizing everything and anything'

Result        *'Any thing for me, if you please?'*
              Winslow Homer, 1864

Source        Google image search 'labelled for reuse'

Chance Coughenour

Page 219    'Providing heritage data openly online is the next big challenge that needs to be overcome in coming years.'

| | |
|---|---|
| Search | 'providing heritage data' |
| Result | Drew Pocket Map of Florida 1884 |
| Source | Google image search 'labelled for reuse' |

Eugene Ch'ng

Page 235   'Stories are the real value of objects.'

Search   'stories, value'

Result   Mrs Enid Layard
Julia Margaret Cameron, 1869

Source   V&A online collections

Eugene Ch'ng

Page 236   'When memories are still alive, there is an urgency to collect and record them.'

Search   'memories'

Result   Buddhist vihara cave
William Simpson, 1862

Source   V&A online collections

Eugene Ch'ng

Page 234   'Chinese culture varies, and ways of interpretation have always been different from the West's.'

Search   'Chinese culture varies'

Result   Duck boat painting
1800–20

Source   V&A online collections
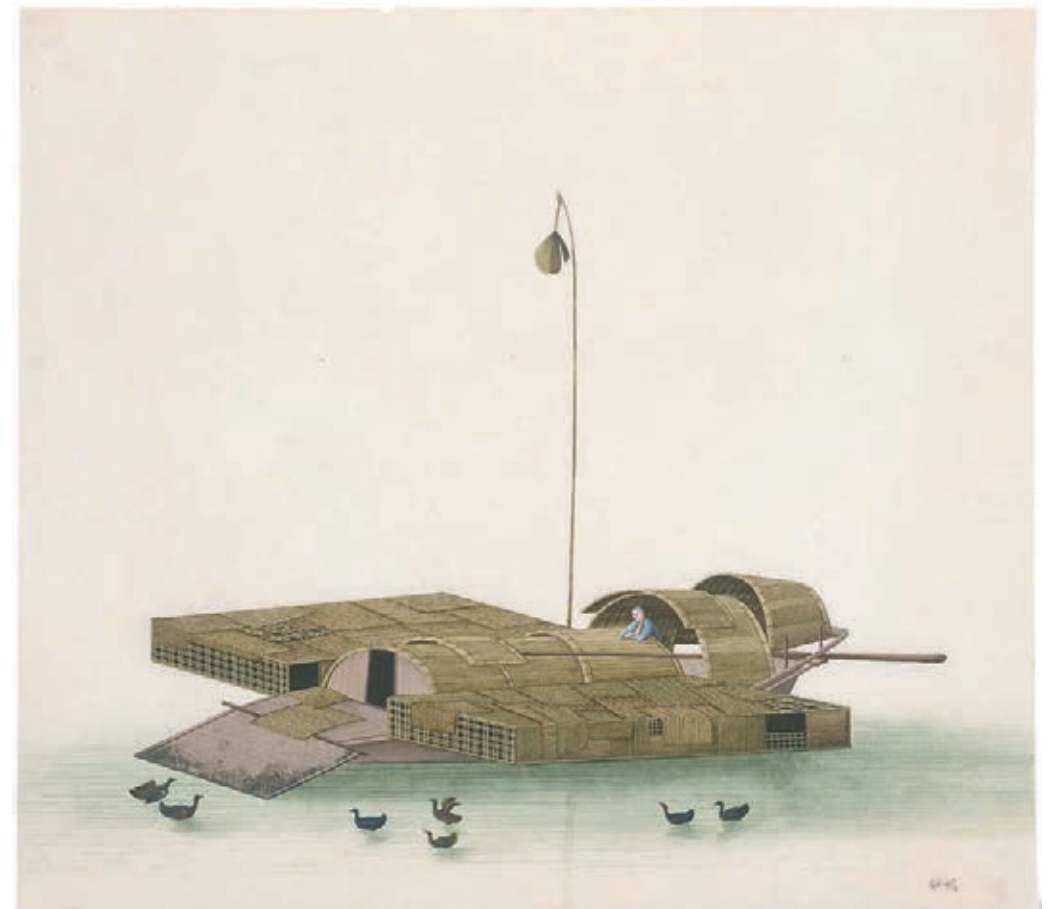
# Reaching out to the World with Open Art Collections

## Merete Sanderhoff

If museums were intended as places of learning, how will they adapt to an age where most learning takes place online? Merete Sanderhoff takes this challenge as a call for museums to adapt, by radically rethinking their relationship and attitude towards their own objects. Through opening up and sharing access to a collection more widely – and the ideas and creativity contained within – museums will be able to remain vital centres of knowledge and cultural development in the twenty-first century.

HOW DOES ENLIGHTENMENT HAPPEN IN A DIGITAL AGE?

Museums in the modern, Western sense were conceived in the eighteenth century as temples of the Enlightenment. They were intended as places where learning, or *Bildung* (a wonderfully untranslatable German word) could take place for all citizens of the Western world's newly founded democracies.[1] In the early days of the museum institution, democracy was only intended for certain sections of society – those privileged with the personal freedom and ability to sustain themselves economically – whereas servants, women, minors and the poor were largely precluded from participating in political and cultural life.

Since then, our understanding of democracy has evolved. So, too, has the notion of museums and the role they play in society. No longer authoritarian temples of expert knowledge, in recent decades museums have changed their self-perception to one of hubs for inclusive dialogue and ongoing negotiation of cultural positions and meanings. At the same time, they retain their foundations in the Enlightenment paradigm of free and equal access to culture for all (although in the eighteenth century, 'all' did not really *mean* all). This sentiment is also at the heart of the Universal Declaration of Human Rights, formulated and ratified by a global community of nations in 1948. Article 27.1 reads that all human beings are entitled 'to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits'.[2]

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Where do learning and enlightenment take place today? Do members of the public go to museums, libraries and archives first when looking for information and facts about history and culture? We all know, instinctively, that this is not the case: people's first port of call is the Internet.

Why is it crucial for museums to be accessible online? Because studying cultural heritage artefacts and documents can open up new perspectives and outlooks on the world and our own place in it. It enables us to make connections, understand cultures beyond our own, take part in critical fact-based dialogue and contribute to a reflective societal debate.[3] This is the *Bildung* foundation that democratic societies are built on, to this day, and which was at the heart of Henry Cole's 1867 'Convention for Promoting Universally Reproductions of Works of Art'.

In practice, the less affluent and those with less education remain statistically under-represented in museums. Digitization is a game-changer in this respect. Online access to the digital copies of works in museum collections holds the potential to democratize museums and the treasure troves they contain, at least for everyone with an Internet connection. Although this still excludes large populations, over 4 billion people worldwide are connected to the Internet today. Therefore, we may recognize that a considerable section of the global population – and certainly more than those who are able to visit museums physically – can enjoy museums when they are accessible online.[4]

THE WISDOM OF THE CROWDS

Michael Edson, co-founder of the Museum for the United Nations, UN Live, has asserted that 'among the educated, Internet-connected inhabitants of planet Earth, there are one trillion hours of free time every year that could be used for community action, civic engagement and learning' – with reference to Clay Shirky's influential book *Cognitive Surplus: Creativity and Generosity in a Connected Age*.[5] Since 2010, when that book was published, over a billion people more have come online. A remarkable example of the 'creative and generous cognitive surplus' Shirky explores in his book is the existence and continuous expansion of Wikipedia; an open encyclopedia, co-created by over 100,000 active volunteers in more than 280 languages, and consulted by over 32 million users across the planet.[6]

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A palpable advantage of digitizing and sharing online museum collections worldwide is the fact that most of the holdings we have are inaccessible to the public most of the time, stowed away in storage rooms and archives – either because of limited exhibition space, and/or because the works are too fragile to be put on display. At the Statens Museum for Kunst (SMK), the national gallery of Denmark, a collection of 260,000 works is represented in the physical galleries by just 2,000 works – less than 1% of the whole. The unlimited space of the Internet offers museums ways to overcome this involuntary prevention of public access to substantial parts of our collections. As a report on the Rijksmuseum's large-scale digitization programme stated, 'There is not a single physical space where all our heritage can be shown, but on the Internet you can.'[7]

Within museum circles, it is widely recognized that digitization enables us to open up access to fragile works while simultaneously preserving the originals under secure conditions. It ought to be equally recognized that sharing collections digitally enables us to demonstrate the true cultural diversity of our heritage. Museum holdings are often made up of artefacts with diverse cultural origins and backgrounds. By releasing digital copies of world heritage, museums can place their collections where they rightfully belong – in the hands of the peoples of the world.[8]

In the light of such realizations, it is time to rethink how we reproduce, store and share global cultural heritage on twenty-first century terms. The baseline will be

to digitize as much of our collections as we can, and make them available on as open terms as is permitted. A fairly uncomplicated place to start is with works in the public domain. In many countries, artworks are protected by copyright until 70 years after the death of their creator. Once the artist's rights expire, the work automatically becomes part of the public domain. Although rights and restrictions often prohibit museums from sharing freely works in our collections, it is worth remembering that the accumulated corpus of public domain works held in the world's museums by far exceeds in volume what is copyright-protected. As Professor of Intellectual Property Law Paul Torremens has noted, copyright is 'a little coral reef of private right jutting up from the ocean of Public Domain.'[9]

However, reproductions of artworks potentially give rise to new rights; in many countries, a photograph is protected for 50 years after it was taken. This is the reason why museums around the world are entitled to restrict usage of reproductions of artworks in their collections that are in the public domain. For the same reason, Europeana – the platform for Europe's digitized cultural heritage – has issued a Public Domain Charter that encourages the museum sector to recognize the public domain as a commons of which we all share ownership, and for which we are all responsible: 'Works that are in the Public Domain in analogue form continue to be in the Public Domain once they have been digitized.'[10]

## FLOWING WITH THE CURRENT

Providing open access is a powerful way to democratize cultural heritage collections and effectively hand them over to the public in digital form. This opens up new opportunities to connect with audiences in all their diversity, and encourage people to engage actively with their heritage: to explore, study, learn and create (with) culture themselves.

Opening up digitized cultural heritage obviously entails a loss of control. However, even without open licensing, since the Internet entered the stage, most museum collections are shared and re-used beyond their control anyway. For decades, people have been taking their own pictures of artworks in museums, or scanning them from publications, and uploading those images to the Internet, regardless of the restrictive image policies museums and publishers may prescribe.

The Rijksmuseum in Amsterdam offers a world-famous case of how open access can change a museum. In 2011, when the museum was planning its new website, staff did a Google image search for some of the absolute highlights in their collection, among them Vermeer's masterpiece *The Milkmaid* (c.1660).

The search returned tens of thousands of images, in a multitude of qualities, many of them poor yellowish copies, making it next to impossible for users to discern which reproductions most closely resembled the original work. In fact, all of those low-quality copies on the web confused people to a degree where they simply did not believe the postcards in the museum shop were showing the original painting.[11] Recognizing this, the Rijksmuseum decided that opening up their online collection would be the best defence against what has since become known as the Yellow Milkmaid Syndrome.[12] Today, around 600,000 images are available for free download in high resolution, and many more will follow towards 2021, when the museum aims to have made its entire holdings of one million objects available online.

An obvious benefit of providing such free and unrestricted access is the opportunity this offers Wikipedians to use quality images and data from trusted sources to illustrate articles. What is well worth noting is that, being an open encyclopedia, every piece of content published in Wikipedia is automatically made



available for free re-use – it is a knowledge bank *and* a commons.[13] This means that to do their work, Wikipedians are dependent on images and source materials that are free of exclusive rights. As long as museums put rights on reproductions of their artworks, those images will not be able to enrich Wikipedia, and thereby enable millions of Internet users to find trustworthy information about the world's artistic heritage.

As noble as it would be for museums to give up licensing their digitized collections solely for altruistic reasons, this is not the primary motivation for the Rijksmuseum and other pioneers to open up. In many ways, it is simply common sense to follow the digital current instead of trying to swim against it. In a report about the experiences of implementing an open policy at the Rijksmuseum, it is explained that: 'As the images came from a trusted source, the good digital copies were quickly adopted by large knowledge-sharing platforms such as Wikipedia, making the bad quality images drop in popularity. The Rijksmuseum version now shows up first in a Google image search.'[14]

In other words, the potential of open access makes it worth giving up control (the little we have left of it). By actively working with the forces of the Internet and social sharing, museums stand a better chance of influencing how their collections are represented online, and of increasing the relevance of what they offer to twenty-first century publics. Providing open access to public domain artworks adds a new dimension to museum collections; they become toolboxes full of stellar raw materials for the creatives, developers, producers and explorers of the world. Furthermore, the loss of revenue entailed by giving free access

is outweighed by the benefits of hugely increased online visibility, and new philanthropic perspectives, as expressed for instance by the Rijksmuseum: 'We lost all of our income on direct sales of images, but we gained a lot of new friends, sponsors and new funding streams (more than we lost from revenue).'[15]

NEW USE FORMS, ORCHESTRATED AND UNFORESEEN

At SMK, approximately two thirds of the collection is in the public domain due to its age. Inspired by the example of the Rijksmuseum and other pioneers, we are working to provide open access to those parts of our digitized collection that are free of rights. Though we have not come as far with the initiative as our Dutch sister institution, even with the limited amount of images made available so far – around 25,000 – we can demonstrate a significant change in how the collection is used. From being primarily a resource for scholars, students, museum professionals and publishers, it is now also being utilized by designers, coders, app developers, startups, digital educational platforms, school children, Wikipedians, film and documentary makers and many, many more – often as raw materials for creative purposes such as remixing, building and social sharing, and often in contexts which we at SMK would have never dreamed of.

A recent example of such unforeseeable usage is the scenography of the Canadian-American Netflix series *Alias Grace*, based on the bestselling novel by Margaret Atwood. Set in 1840s Canada, the walls of the mansions where the main character Grace Marks' troubling story unfolds are densely adorned with Danish 'Golden Age' paintings. These are printed from free, high-resolution image files of public domain artworks found in SMK's online collection – and neatly framed to blend into the historical environment. The end credits do not indicate the source of the images, which is perfectly legitimate since they have been dedicated to the public domain and are free of any restrictions. At the end of the day, Netflix's raison d'être is to create and disseminate entertaining film and TV, not to educate the public about art history: that is the museum's job. We have pursued this by actively sharing the story with our communities, and by enriching the Wikipedia entry on the TV-series with facts about, and images of, the artworks.[16] People interested in the series are likely to look for information about it on Wikipedia. We have made sure that here they will find valid information about the artworks, their historical context, and possible meanings, and where to see the original paintings.[17]

The *Alias Grace* example shows that opening up the museum in the digital age is not done by merely making the digitized collections available online. New kinds of tasks arise in the unpredictable interaction with the surrounding world. This requires museums to adopt an open mindset and be responsive to the interests and needs of a diverse crowd of users.

To complement this story of unforeseeable usage, here is an example of the deliberate work we do to foster creative engagement with our public domain art. 2017 saw the dawn of a new experimental collaboration between the Dutch-American 3D print platform Shapeways and SMK, in the jewellery design contest 'Art Jewels'. Curators at SMK selected six 'jewels' from the collection. Creatives and designers were invited to draw inspiration from the motifs and possible meanings of these Old Master paintings, and create new art jewels – this time in the literal sense. More than 250 designs were submitted from all over the world: a stunning response to a pilot initiative which was a first, both for Shapeways and SMK.
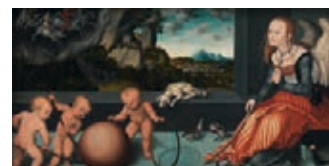
The winning designs were 3D printed and put on display in the museum, and sold in our shop. Several of the winning designers travelled to Copenhagen to be present at the launch – one of them all the way from Los Angeles. In an interview, she expressed what it means to her to have her work recognized in this way: 'I very much appreciate that someone acknowledges my work. It encourages me to pursue a career in jewellery.'[18]

Were museum collections founded to feed into designers' and scenographers' work? Many museum people might oppose the idea. However, it is not our role to judge what the public domain is used for. We are the stewards, not the owners of our collections. Furthermore, who knows where people will have their first touchpoint with an artwork? If it happens to be through a piece of jewellery or a TV series, that could be an opportunity to form new relationships between people and art.

REACHING OUT TO THE WORLD

Do museums stand a chance of preserving, and developing, our relevance as hubs of learning and enlightenment in a digital age? Open access to cultural heritage as raw materials allows people to create an understanding of the world and their own place in it through active processing, adapting, rebuilding and repurposing. The word *Bildung* is particularly apt in this context, since etymologically it is derived from the verb *bilden* (to form or create) which again originates from the noun *Bild*

(image). Images, also linguistically, are building blocks for learning. We are formed by exploring and creating images.[19] In this sense, the concept of *Bildung* is connected with that of building, in the sense of creating a brand-new structure, or architecture, from our content. Indeed, as Mikkel Bogh, the Director of SMK, writes on his blog:

01
Volunteers working together with art historians to enrich the Danish Wikipedia with digitized artworks and source material from Danish art museums.
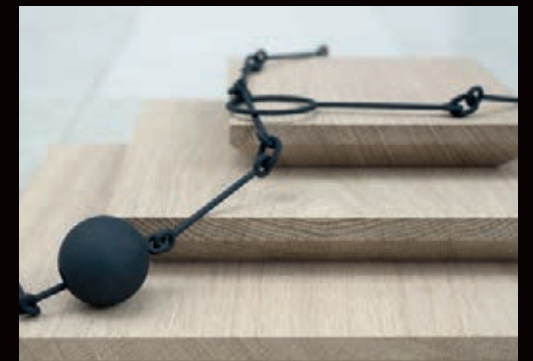
01


02


02
Lucas Cranach the Elder (c.1472–1553), *Melancholy*, 1532; SMK – Statens Museum for Kunst.

03
*Melancholy* necklace by 3different/Milano. Winning design in the Art Jewels contest, 2017.

03

'With our digitized collection we can help educate and enlighten people, supporting them in their endeavours to become reflecting, creative individuals. But in order for this to happen our cultural heritage must belong to everyone, and each of us must be free to use it in exactly the ways we need and dream of. As museums, we do not hold any patent on how cultural heritage can and should be interpreted and used. Our role is increasingly to facilitate the general public's use of cultural heritage for learning, creativity and innovation. Today, the museum as a place of enlightenment is based on interaction. We are all part of this web. We enlighten each other.'[20]
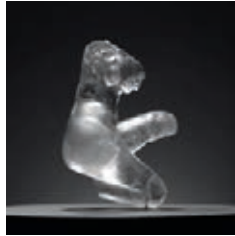
In a reality where half the world is online and an increasing share of the public is growing accustomed to learning by doing – actively participating, exploring and questioning as part of a learning process, rather than passively consuming established knowledge – it is necessary for museums to adapt and respond in order to remain vital places for knowledge search and cultural development.

# Environmental Reproductions

# David Gissen

While new technologies are helping to recreate historic artefacts in ever more precise ways, the environmental conditions in which such artefacts were historically displayed is often overlooked. A painting by candlelight is very different from a painting in a 'white cube' gallery; even more so from a rastered image on a computer screen. In short, environments are always present in our experience of a work. As reproductions, both physical and digital, become more prevalent, David Gissen implores us to consider new ways in which environmental considerations can help convey the multiple meanings and interpretative richness of copies.

When we create a reproduction, we often consider an artefact to be the subject of the reproduction, but reproductions also convey representations of environments as well. From 2000-year-old Roman rock crystal reproductions of Greek sculptures that capture ambient light, to contemporary digital photo-processes, reproductions often contain information about their surroundings.[1] The environmental character of reproductions is particularly noticeable with late twentieth-century reproduction technologies, such as colour photography, high-quality sound recording and contemporary digital scanning processes, such as laser and photogrammetry. All of these technologies capture waves of energy –

as either light or sound. A trained eye or ear can sense the surrounding context of an artefact evident within reproductions via varying levels of chromaticity, brightness, contrast reduction, glare, reflectivity, noise, reverb or echoes. The presence of these factors suggests that the reproduction of artefacts offers an unexpected manner to experience environments.

To think about the environmental quality of reproductions is ironic, as one of the chief and enduring criticisms of reproductions is that they tend to isolate an artefact from any sense of context. In the early twentieth century, the art historian Ernst Langlotz (1895–1978) voiced this criticism when viewing official photographs of ancient Roman and Greek sculpture. Such criticism is reiterated in the writing of Erin Thompson – a contemporary commentator who claims that photogrammetry and laser scanning create a sense of an artefact that appears devoid or isolated from its historical or contemporary setting.[2] In both early twentieth-century photographs and contemporary photogrammetric images of ancient sculpture, paintings, objets d'art and architectural ornaments and fragments, objects typically float within a pitch-black space. On old plate negatives this was achieved by over-painting – a process reiterated today in photogrammetric 'masks'. The resulting images of an artefact floating without any sense of context or environment can be arresting and are an analogue to the larger museological practices of which they were a part. Critical responses to these practices extend back to the 1930s when Langlotz rephotographed ancient Greek sculptures outside on the Athenian Acropolis so that the sculptures would be surrounded by their historical context and illuminated by the 'Attic light'.[3]

Any absolute physical and contextual dislocation within reproductions is more appearance than reality: all reproductions occur somewhere and under a certain set of conditions that become imprinted in images and recordings. In addition to these technical aspects of the environment that are conveyed with

contemporary forms of reproduction, we also can sense cultural attitudes as well. All reproductions represent particular attitudes and prejudices towards viewing, reading, listening and interpreting artefacts, and these also become embedded within these reproductions' aesthetics. Rather than being devoid of environmental qualities, many of the environmental values projected within twentieth-century reproductions are actually close to those of twentieth-century modernist spaces: brightness and illumination, emptiness, consistency and clarity. Thus, whether one reproduces a sculpture under artificial illumination in a studio, on top of the Acropolis, or in a photogrammetric computer programme under consistent neutral lighting, the environmental values are similar.

While this modern environmental sensibility permeates most reproductions discreetly, there are a series of practices that are invested in revealing and challenging its hegemony. These begin to suggest how the environment of a reproduction can become a more forceful, narrative and even disruptive element within a reproduction. They also begin to articulate why that might be desirable.

One set of practices emerges from the fine arts in which artists self-consciously convey aspects of the potential experience of an artefact, as in the case of works of art about our experience of culture and the institutions and labour that surround its experience. For example, Thomas Struth's well-known photographs of people looking at canonical works of Greek art in museums offer an entirely different sense of an artefact than its official reproduction.

More recently, we can identify genres of reproduction that call attention to the actual work of producing reproductions. This includes artists such as Andrew Norman Wilson, and who combed Google Books looking for slip-ups in the photography of books in which the images of the hands of the people who turn the pages of the books we read online are displayed as part of the content of the book. All of these practices make the 'fourth wall' of culture more prominent – the spaces and institutions that display works and the mundane labour of reproductions. Struth's photos of people gazing at antiquities and the glimpses of hands involved in making Google books also enable us to see the uneven demography of the culture industry.

In addition to these practices of institutional critique, there are other less critical, museological practices that, nonetheless, offer counterpoints to the more modern environments present in most reproductions. For example, in 2015, the British Museum and the San Francisco Bay Area organization CyArk collaborated on creating a video of an Assyrian palace relief as it was experienced when lit by torchlight. The authors of this reproduction teleport us back into

time to understand the original lighting of these wall panels. In a similar example from 2002, the British computer scientist Alan Chalmers created a programme, derived from an energy analysis tool developed at Lawrence Livermore Laboratories in Berkeley, to recreate the original colouration of Duccio's *Annunciation* as it would have been perceived under candlelight. Chalmers went so far as to work with an archaeologist who reconstructed fourteenth-century beeswax and tallow candles. These

were analysed with a spectroradiometer to arrive at the colour values used to remaster the Duccio reproduction.[4]

Both of these experiments offer an opportunity to stage environments otherwise impossible within a public gallery space and within the vicinity of a valuable work of art. Whatever our thoughts about the aesthetics of this rendering, the thinking behind this work is as much trans-historical as it is historical: such a work takes contemporary values of viewership – seeing the formal qualities of an artefact under strong gallery lighting – and projects this backward in a type of historicist context; as if such an experience of viewing would have been valued several thousand years ago.

The above types of environmental reproductions extend to other artefactual forms: for example, at Stanford University, the scientist Jonathan Abel has advanced the use of a tool called a convolution reverb processor that can re-situate reproductions of audio within the original context where they were performed. In a 2015 performance at Stanford, a choral group sang a Byzantine choral work and the audio output was processed live through a convolution processor to make it sound as if inside Hagia Sophia in Istanbul. We can listen to a recording of this that very closely approximates the sound of this music in its original context. All of these works open up the representational possibilities of environmental reproductions, but they also open reproductions to new forms of essentialism that link the authentic appreciation of an artefact to some simulation of its original environment. The recreation of the original environment of a work of art was a value that was advanced in the early nineteenth century in the first art and architecture museums in France. It was revived in the 1930s by the German art historians Ernst Langlotz (described above) and curator Alexander Dorner in the context of reproductions. Langlotz wanted Greek artefacts to be photographed in Greek light, and Dorner wanted the lighting of a medieval gallery of art in Hannover to be dark and gloomy – as he imagined the interior of a medieval cathedral. He extended this exploration to the display of reproductions which could more easily be placed in simulated environments.[5]

The recreation of an artefact's original environment challenges the typical museum and reproduction experience, as both provide an experience of an artefact outside its everyday utility as a religious or cultural object. There is, in other words, both an environmental and social history to seeing artefacts that would be very difficult to align without also recreating the social status of a work. One of Langlotz's and Dorner's contemporaries, Walter Benjamin, argued that reproductions diminished the 'aura' of a work of art. By 'aura', Benjamin meant the alignment of spaces, times and the social status of artefacts that reproductions inherently destabilize.[6] A simpler way to put this is that through reproductions, we can experience a work anywhere and in any manner.

Finally, several contemporary forms of environmental reproduction also rely on an intense naturalism and realism, which is to say that to imagine a work in any way other than what is presented in a reproduction is almost impossible. In response to Dorner's contemporaneous experiments with reproductions, the art historian Irwin Panofsky argued that the ultimate value of a reproduction of either a Cézanne or recording of Enrico Caruso was not to imagine that one is actually either standing in front of a Cézanne or in the orchestral hall with Caruso. Rather, one should understand that what one sees is a quality reproduction, by which he meant that the experience of seeing coloured ink on paper (in the case of the Cézanne reproduction) or the sound of metal needle hitting plastic (in the case of a recording) was well made and self-evident.[7] 30 years later, conservators such as Cesare Brandi were making similar arguments regarding the treatment of original artefacts. Brandi, in particular, called for conservation practices that were self-evident and multi-temporal – that were capable of representing multiple eras within a work's history.[8]

We can build on existing efforts and critiques and make environmental reproductions of artefacts into something far more theoretically rich. We can use the critical concepts of Benjamin, Panofsky and Brandi as well as critical techniques from art practices to rethink the implications of technical reproduction processes on the social and cultural meaning of artefacts.

The sense of historical illumination within reproductions of ancient artefacts is one subject, among many possibilities, that offer opportunities for critical work. While some conservators and curators might want to use an environmental reproduction to understand how a work of art appeared within the lighting conditions from the time of a work's creation, a surviving sculpture – from the mid-nineteenth century or earlier – was viewed under many different types of interior or architectural light over its history. In fact, some latter forms of illumination might be more important to a work's history than those from the time of its creation. For example, in the nineteenth century, ancient marble sculptures were often set in rooms with intense chromatic properties giving them forms of ambient

polychromy. Additionally, many possible light sources could have illuminated an older artwork: wax and tallow candlelight, coal-gas light, arc-light, incandescent light and moonlight (recall that the night was much brighter 150 years ago than it is in most cities today). And just as in our houses today, it is also entirely possible that multiple forms of light were used at a particular time.

In order to begin to embed this into a reproduction, we can revisit tools already utilized to model energy spectra, such as the one from the Lawrence Livermore
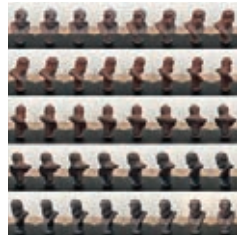


labs that inspired Alan Chalmers. We can then digitally reconstruct and reproduce an artefact as if lit by a variety of spectra – moonlight, candle-light, gas-light and hearth-light – and that changes its appearance depending on our viewpoint. One way to think about this process is that it is a reproduction that reproduces a complex and changing historical condition of an artefact. Everything from the artefact's form to what we imagine to be representations of skin tones might begin to change

in such a reproduction – enabling us to understand how environments codify contemporary social and cultural concepts of colour and whiteness.[9]

Such pursuits enable an artefact's reproduction to not only give a heterogeneous sense of how it was experienced in different times and settings; it also might change the meaning of originals. This offers the public the opportunity to understand the surrounding of an artefact as something that is constantly changing, that will change, and that changes artefacts. In contrast to contemporary conservation practices that advance one type of environment for the reproduction of countless different artefacts, these latter practices imagine the countless environments that might be embedded in the experience of one artefact.

Ultimately, environmental reproductions enable us to transform reproductions and the artefacts they represent into far more volatile aspects of culture. This volatility of the reproduction is something that we must continue to pursue so that reproductions will reveal the wider frameworks that predetermine all forms of cultural experience.
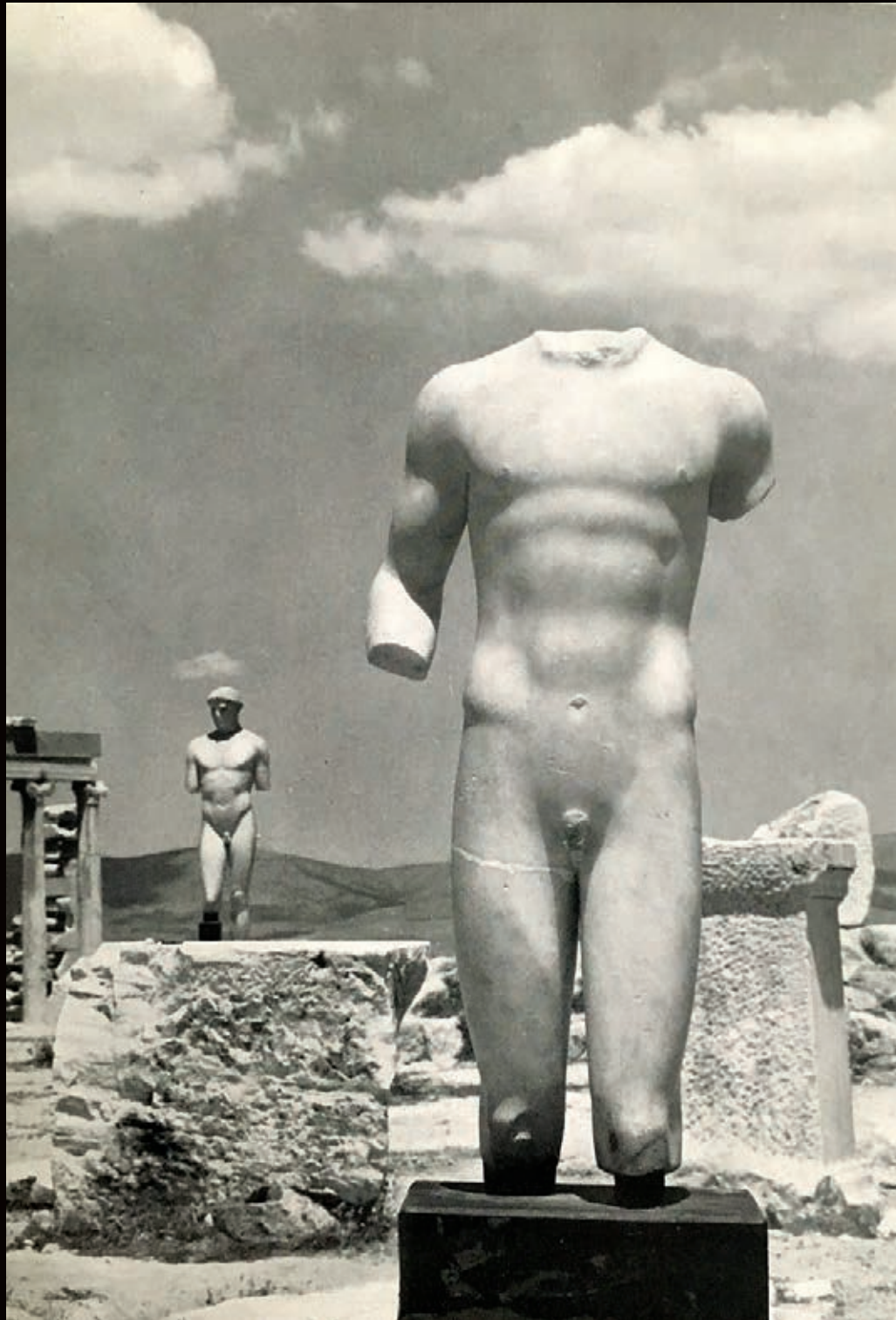
01
Sculptures from the
collection of the Acropolis
Museum, taken outdoors
and photographed on a
sunny day.

02
Statuette of Venus, rock
crystal, 1st century BCE.
The object takes on the
chromatic properties of its
surroundings.
The J. Paul Getty Museum,
Villa Collection, Malibu,
California.

03
Photograph of a plaster
cast of a 4th-century
Greek statue of a dancing
bacchante, on a black
background, 1889.

04
Photogrammetric model
of Kouros. Athens
Archaeological Museum.


02


04


03

05
Torch-light simulation
of the Siege of Lachish,
CyArk and the British
Museum, 2015.

06
*The Inland Printer*, Andrew
Norman Wilson, 2014.

07
A 'multi-illuminant
reproduction' of a
Lysippian Hercules,
excavated from Pompeii
in the mid-18th century.
Depending on the
position of the viewer, the
sculpture appears as if
illuminated by moonlight,
candlelight, gaslight or
hearthlight.



05



06

07

# Cultural Heritage Beyond Google Search

# An interview with Chance Coughenour

In 2011, Google launched a platform to host high-resolution images of famous artworks online. Museums were encouraged to partner with the search giant, as a way of disseminating their collections and to experiment with new forms of online learning and curation. Today, Google Arts & Culture has over 1,500 partner institutions and is pushing boundaries with how to display and share cultural heritage online. We sat down with Google's resident digital archaeologist, Chance Coughenour, to get the bigger picture of what the famed search engine hopes to do for culture, and how museums are benefiting from collaboration.

Anaïs
Aguerre

You have a very interesting position, being the first full-time archaeologist working at Google. It would be great to know a little more about how you came to that role and why Google would be interested in employing an archaeologist in the first place.

Chance
Coughenour

I joined Google Arts & Culture primarily because of my background and skills in archaeology, in particular my experience in 3D archaeological documentation. Prior to joining Google Arts & Culture, I worked on a European Commission-funded project focused on digital cultural heritage that brought institutions together from across Europe, and I worked at an engineering institute researching its applications to archaeology. I've spent years working in these diverse fields – culture, art, history and archaeology – asking the question of how technology can be applied, which is a good fit for Google Arts & Culture.

Google Arts & Culture started in 2010, known as the Google Art Project at the time. Partnered with a handful of the world's top museums, a special gigapixel camera created by Google called the Art Camera was used to take detailed photographs of famous artworks. An online platform was created to make the collections of those museums accessible to anyone for free. Google Arts & Culture has now grown to more than 1,500 partner institutions and non-profits in over 70 countries. They invited an archaeologist to their team because they understood how important heritage preservation is globally and wanted to expand their participation in and contribution to the global heritage sector. In recent years, it's become even more apparent to the general public that our heritage is at risk, for example with the destruction in Iraq and Syria, or what we're losing due to natural disasters and climate change.

AA

We did an interview with Wim Pijbes, the former director of the Rijksmuseum, and he explained to us how critical the collaboration with Google was in developing the Rijksstudio, the online platform for displaying high-resolution imagery from their collection. The necessity for a museum to have a tech partner is really interesting, but also a challenge to balance those interests. What's your view on this, and what are the benefits for a museum to working with a digital partner?

CC

I'm really happy to hear such great feedback from Wim. We have similar feedback from many directors of institutions that we've worked with from around the world. The mission of Google Arts & Culture is two-fold. It's first to democratize access to art and culture to anyone, anywhere. We do this by using new technology in creative ways: from mobile to desktop applications and platforms, to virtual reality Google Cardboard tours and Expeditions in school classrooms for children. Mostly it's about education and sharing, but it's also about being an innovative partner

for the cultural sector. What we provide to our partners, like the Rijksmuseum, as well as many others, are free tools to digitize, share and digitally preserve their collections. I'll give you an example with the Art Camera developed to take high-resolution images. It's available for free to any institution that partners with us. We send a small team with the camera, they choose the artworks they want to digitize, we put it on our platform and the ownership rights of the content remains with the partner. It's never ours, we don't own any of the content on our site. They have total control over it.

So, the Art Camera is one tool, but we also offer an archival scanner which is used to scan documents. It's a high-resolution camera specifically made to scan manuscripts and books. Recently, we used it with glass-plate negatives from the nineteenth century, which was really impressive. We piloted this use with the British Museum.

We also offer Google Street View to our partners, too. For free, any institution can have us bring a team to capture 360-degree imagery inside their museum, or also outside if they have a sculpture park or other similar content outdoors. We also provide unlimited cloud storage for all the data and images of the content that they want to share on our platform, which is great bonus, too!

AA

In visiting so many museums around the world, have you come across any innovative projects emerging independent of large tech firms? In other words, can museums take the lead in innovation?

CC

Absolutely. For example, I recently visited an archaeology museum in Northern Europe which created immersive experiences taking visitors into the past to learn about the people who lived there, avoiding the way museums have traditionally presented their collections over the last century. It's completely interactive for all ages, offering virtual reality and hands-on learning, well crafted during the visitor's journey.

In the digital world, smaller museums are able to have an almost equal footing with larger, internationally known museums. For example, we organize global projects based on themes, where we sometimes bring up to 140 or 180 institutions from around the world together to tell their stories about the same theme. This means a small non-profit or museum can offer their unique contribution to a global project from their collection alongside stories from the Metropolitan Museum of Art, the V&A, the British Museum or the Pergamon Museum, for example.

I think this is something new and unique in the museum world, because, of course, museum websites are mostly about their own collections, exhibitions

and upcoming events. Museums obviously do amazing projects together and collaborate with others with exchanging objects, creating physical temporary exhibitions together. What Google Arts & Culture provides is a single, free online platform where the digital presentation of global projects can easily be hosted and accessible online without an exhibition close date. This also offers a great resource for the educational sector and researchers, too.

AA    One of the things which I am slightly concerned about is the fact that we are pushing this digital agenda at a moment when half of the population still doesn't have access to the Internet. Do you feel there is a risk that we are somehow increasing a global divide by providing so much content online, when half the world doesn't have access to it?

CC    I don't believe that we're increasing the divide. The rate of people who are gaining access to the Internet is growing exponentially, primarily thanks to mobile devices. We also need to consider the fact that anything we create and share and publish is not intended to be published only for one time, but it's to be made accessible for future audiences, too. If we create a project focused on fashion or natural history now with institutions from around the world and make their stories accessible through a central web portal, it can be published now but also in five or even 10 years – when someone gains access to the Internet for the first time, they will still have the resource available. From a perspective of digital preservation, we want to preserve these online exhibits and content, making them accessible for future generations.

AA    Speaking of preservation, in the museum world, we have quite complex policies and protocols about how we preserve physical artefacts in perpetuity. So, how do you translate that to the digital world? What's the position of Google Arts & Culture in this regard?

CC    Preservation means different things to different people: to the general public, a museum conservator, a curator, an archaeologist. From my perspective, preservation still has the physical aspect; it's about documenting and digitizing physical objects so that you have a lasting blueprint. If the physical object decays or is lost or destroyed, you still have data and information about it, the history related to it and the physical dimensions of it. Ideally, that blueprint could be used to help restore it in some form to make it accessible in the future.

When it comes to the digital world, you have documentation files of physical objects, which also need to be stored and made accessible in the future. So, the challenge we have is that when, for example, an artefact is captured in 3D, we should ensure that this data is updated to new file types over time. We can't just

save it on a disk or upload it to a cloud and expect it to be accessible 10 or 20 years from now, because file types become inaccessible over time.

Vint Cerf, our Chief Internet Evangelist at Google and one of the fathers of the Internet, has made this one of his personal missions; to find ways to preserve digital objects for the long term. We launched a project last year with Rhizome, a non-profit institution based at the New Museum in New York, which creates tools to do precisely this. Most people don't realize it but people are producing art today that is only digital from the very beginning, known as 'born-digital' art. If I produce artwork using Google Tilt Brush, that artwork is only viewable in VR or a 3D viewer. It's only a digital thing. So, we partnered with Rhizome and hosted their tools on Google Cloud to emulate the software and web browsers that were used in the 1990s and early 2000s for artists to continue to share their art to the world. Last year, through this collaboration, we have made 35 artworks that were previously inaccessible due to digital obsolescence accessible for free to anyone.

AA    That's truly digital archaeology.

CC    Indeed. In terms of other preservation strategies, we are trying to learn from past challenges in the way data was stored, like floppy disks, CD ROMs, tape drives and so on. Now, most of our data is saved on cloud infrastructure, so it's less about physical data storage. The focus is now more about file types, metadata and how that information is going to be stored, saved and accessible in the future. There's CIDOC CRM, which provides us with a common semantic framework used by cultural heritage professionals to map their data between different types and sources of content in cultural heritage. It's a great example of how the heritage community is coming together to agree on a standard, an ISO standard since 2006 for heritage documentation.

Specifically for archaeology, there are initiatives addressing this challenge. The Archaeology Data Service at the University of York is focused on the long-term digital preservation of archaeological data. Unfortunately, there still isn't a 'one size fits all' solution yet.

AA    It feels also that there is somehow a lack of communication and sharing of information. You have a lot of projects that are sitting on museum computers that even people within the organization don't know about. So sharing and collaborating are still key elements to the digital preservation challenge.

CC    It's about open access. Providing heritage data openly online is the next big
challenge that needs to be overcome in coming years. Many people, universities,

museums and institutions around the world are collecting amazing high-quality 3D datasets, but, for the most part, it's being published in traditional journal publications in print or online in 2D, which rarely reaches the general public.

AA So let's go back then to the general public. Could you tell us a bit more about some of the applications for public-facing projects that you've been busy with at Google?

CC Sure, one of our recent projects is one of the strongest examples that I can give. It's our collaboration with the British Museum on a project we called Preserving Maya Heritage, which can be found on Google Arts & Culture. It was focused both on the general user and researchers, but obviously with the overarching story of accessibility. The Maya collection at the British Museum, also known as the Maudslay Collection because it was collected by Alfred Maudslay, a nineteenth-century explorer,
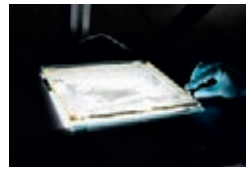
has been relatively inaccessible previously. Less than one percent is viewable to the public when they visit the museum, because there isn't enough space for it, basically. On the project, we've laser scanned plaster casts and digitized glass-plate photographs, created over a century ago, of ancient Maya art and historical texts. We've scanned an immense amount of archival material with the British Museum and worked with them to help build online exhibitions telling the stories about the collection. It's a perfect example of users gaining access to cultural heritage that wouldn't have been possible in the physical museum space. It's been published in English and Spanish, and it's also accessible to people who may not ever have the opportunity to visit London.

We can also use these projects to experiment with broadening the range of visitors. Our social media team worked with the British Museum to create fun ways for the public to engage with and learn about the ancient Maya. We had animated quotations that were visually interactive, and the social media outcome was incredible: many more people engaged with the content and stories over social media than we had expected. We're happy to have reached new audiences with fascinating stories about the Maya.

AA I've heard a number of people say, 'Oh, yes. That's great, we can digitize our collection.' But then collections are digitized and there's no plan for what to do with it. So, there's a lot of data already out there, not being packaged or used in the right way.

CC I fully support the idea of digitizing collections first, then seeing what you can do with it later. An example of unknown use of digitized content is Rekrei, a

crowdsourcing platform I started with Matthew Vincent in 2015. We used crowd-sourced images of destroyed heritage. Since people had taken photos of heritage – objects in museums or at archaeology sites – while on holiday, after these heritage objects were destroyed in Iraq, we were able to use their pictures to reconstruct digital models and make them accessible online. So the data became very useful

to preserve the memory of an object that was destroyed or lost. I think digitizing everything and anything, and keeping it digitally preserved, even if you don't have a clear idea of how to use it, is still extremely important. We don't know how it may be useful in the future, but most likely, it will be to someone.

AA To get back to open access, you're working with CyArk, who have been pioneers in making large-scale 3D scans, to host their work online. Can you tell us a bit more about the project?

CC Yes, the project with CyArk is two-fold. First, we're providing a platform for CyArk to offer open access to its amazing data collection – they have one of the world's largest 3D collections of heritage data. It will be hosted on Google Cloud and made accessible through stories on Google Arts & Culture about each heritage site. We're starting with about 25 sites from around the world as a pilot, and CyArk will continue to increase and publish their entire collection over time. We're also going to launch a Google Arts & Culture Lab Experiment focused on one site, where we combine 3D and VR technology to create an immersive and interactive story using 360-degree video, photogrammetry and laser scanning. The story was written by Alexandra Green, a curator at the British Museum, and the voice-over is by Bettany Hughes, an author and documentary filmmaker. It will tell the story of a heritage site that has suffered from earthquakes over time. We're telling stories that you wouldn't be able to access and see for yourself even if you went to the actual site today, because the temples are unstable and in danger of collapsing.

AA If you think of all the technological expertise that CyArk have, why didn't they just build their own platform? What's the value of collaboration here?

CC They have been trying to do something like this for a number of years, and our collaboration grew out of conversations with them about how we might help them achieve their goal. The technology is at the point now where it's possible to create an open-access platform for them, and we're providing that for free, making it accessible to the public anywhere for non-commercial purposes. It's something we are excited to be a part of.

AA What role do you think public governments or public authorities should have in investing in digital platforms and infrastructure to store and also give access to

digitized cultural heritage? Or do you see a large public-private partnership being a solution for the future?

CC    I think both are already happening: public bodies are investing in storage and creating platforms, as well as establishing partnerships with private companies. So, one example, like many institutions we're partnered with, is the Smithsonian. It's a public institution and it engages in preserving and sharing its cultural heritage collections in their buildings and on their website. They also use Google Arts & Culture. They store data on their servers, but also on our platform. I think that's a good thing; you should store your data in different places so you have multiple back-ups. So, I think public institutions are following both strategies; pursuing public/private partnerships, while also pushing for more robust in-house storage capabilities.
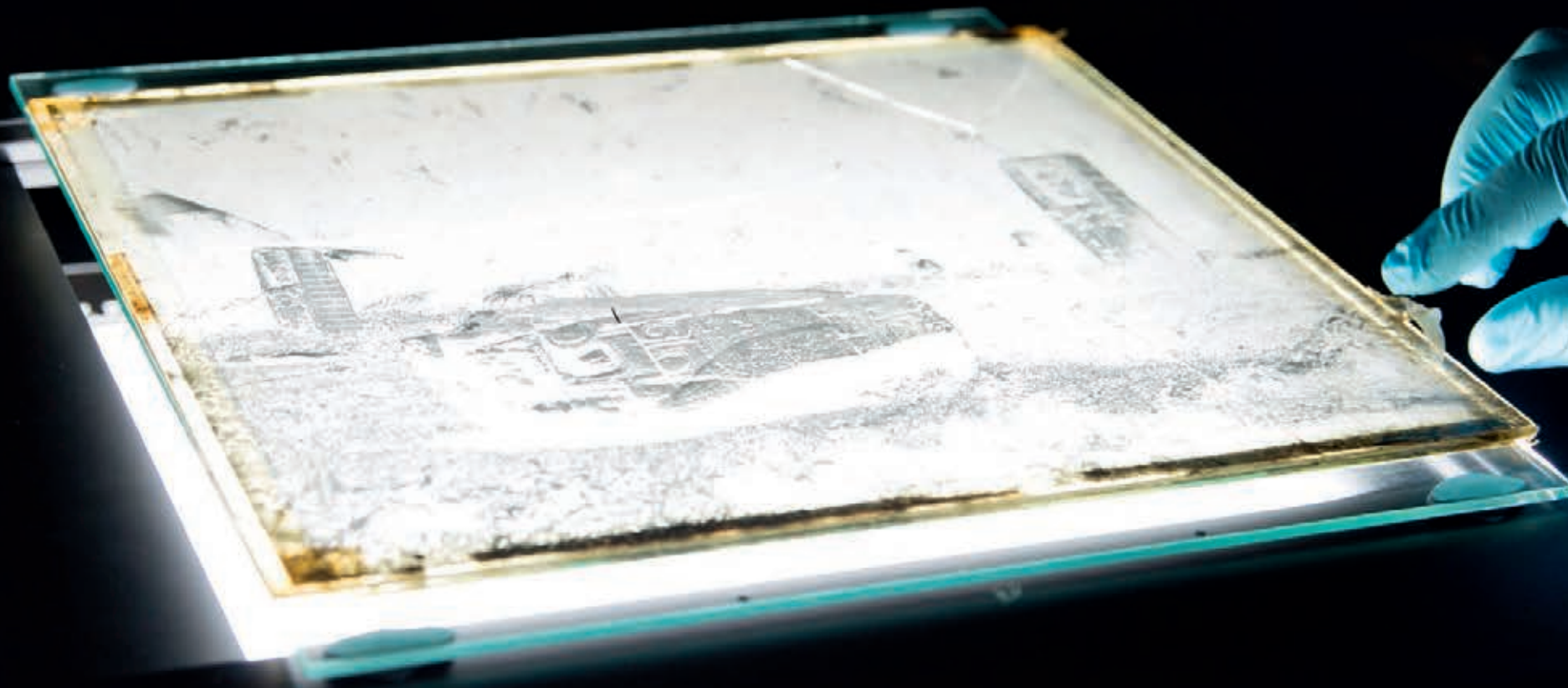
01
Digitizing a glass plate
captured by Alfred
Maudslay in 19th-century
Guatemala.

02
Final glass-plate scan
published on Google
Arts & Culture. Northern
side of the Great Plaza at
Quiriguá, Guatemala.



03



03
The Art Camera by Google
Arts & Culture.

04
Quiriguá Stela D in 1881
and 2017 – combined
images.

05
3D print created from
3D scans of numerous
plaster casts connected
together f virtually from
the British Museum's
Maudslay Collection.
It is the best preserved
record of the tallest
free-standing carved
monument in the ancient
Americas. People shown:
Bryan Allen, Google ATAP;
Acisclo Valladares Molina,
Guatemalan Ambassador
to UK; Jago Cooper,
British Museum.

# The Value of Objects and the Stories We Tell

# An interview with Eugene Ch'ng

In China, museums are set to invest heavily in digital technology over the next five years. In a country that is famously tech-savvy, with a populace of quick adopters of the latest technological trends, the potential for experimenting with new modes of digital interpretation is high. Eugene Ch'ng, Professor of Cultural Computing and Director of the NVIDIA Joint-Lab on Mixed Reality at the University of Nottingham Ningbo China campus, discusses how digital copies might reframe how we collect and interpret objects, the use of technology in Chinese museums and the challenges of remaining connected in the future.

**Brendan Cormier**
We're always curious about how people came to work at the cross-section of museums and digital technology. You have a background in both art and computer science. Could you tell us at what point you first sensed that digital technology could transform access to art and cultural heritage in the way it's doing today?

**Eugene Ch'ng**
There wasn't an exact moment, it was more gradual and formative. I started painting at a very young age, and taught myself to programme when I was about 10 years old. That was in 1984. So, early on I was creating programmes – like a very primitive form of Photoshop – which had brushes, sprays, erasers and a colour palette, which I used to paint digital art back in the '80s. The screen was a green monochrome, but my hexadecimal code and the shapes on the display allowed me to see what colour I was painting in. At around the same time, I became interested in 3D computer graphics as well. So by the time I entered college, in 1995, I'd already learned a lot of the coding and technology for 3D model-making and had made many 3D works. I even won some prizes for those works, from Autodesk, Hewlett-Packard, and CAT User Magazine, which encouraged me to continue exploring.

So, this combination between art and science really came about during that time in the 1990s. When I started my PhD at the University of Birmingham, it was a critical point when I started to work with imaging techniques related to archaeology. I was working with the IBM Visual and Spatial Computing Centre and joined a project to digitally reconstruct Doggerland, a submerged landscape in the North Sea. We had a 3D topology recreated from a seismic dataset, but much of the work required me to model artefacts, which requires a lot of hand-eye coordination. This is again where my art background helped. On the other hand, my PhD also involved

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the algorithmic and mathematical modelling of hunter-gatherer behaviours, vegetation growth and distribution to populate the landscape, and this is the scientific aspect of it. So, this is how I got into cultural heritage with both the art and science fields.

**Anaïs Aguerre**
You've been based in China for the past few years, working again at the crossroads of cultural heritage, museums, and digital technology. How does practising in China differ from elsewhere? For instance, I understand there is a very different cultural relation to the notion of the copy and the value it represents. Do you think that influences the way those digital reproduction projects are carried out, and also the way they are received by the public?

**EC**
The majority of cultural institutions in China, even those at the national level, have only just begun looking into creating a dedicated digital team. Most rely on

commissioned digital work, rather than in-house, and there are some occasional collaborations with academic institutions. That is now changing however, and the majority of the museums that I have visited now aim to form dedicated digital teams with VR and AR expertise within the next three to five years. This was likely due to the massive popularity of virtual reality and augmented reality in the last two years, which you can see trending on social media, in new exhibitions, and even in shopping malls.

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In the next five years, you'll see a lot of changes in Chinese museums. China released its thirteenth five-year plan in 2016 and it will have a great effect on cultural institutions adopting digitization. For example, the Ministry of Culture's five-year plan aims to 'encourage all related institutions to provide the opening of a catalogue of digital resources; a complete shared list of digital-cultural resources.' It also aims to 'let science and technology integrate with cultural heritage, with technologies such as information networks, intelligent manufacturing, VR, big data, cloud computing, Internet of Things, 3D printing.' And this will all be strengthened by the One Belt One Road (or Belt and Road) Initiative, a large-scale development strategy by the Chinese government to build connectivity and cooperation between Eurasian countries [based largely on the ancient Silk Road]. So the Ministry of Culture again states as an aim to 'gradually create a Silk Road cultural database, build public digital-cultural-supporting platforms and strengthen cooperation with the countries along the One Belt, One Road, in digitizing cultural resources for preserving and development.' These national policies will change how museums work in the future, especially in relation to digital copies.

**BC**
So, when something is written into a five-year plan in China, it has widespread implications.

**EC**
Indeed. The Chinese Government has, in the past, supported museums with a lot of money for development, but they are increasingly becoming hands-off. Instead, they're encouraging museums to be creative and self-sustaining by being involved in the creative industries. This has also affected Chinese museums drastically. Once the government financing starts disappearing, you have to be more self-sustaining, which has prompted museums to become more creative and co-operative with other institutions and the cultural-creative sector.

**BC**
The typical Chinese audience is very tech-savvy, everyone is connected to WeChat, and uses their smartphone daily. In short there's a really fast adoption rate to new technologies. How does that influence the kind of museological work you think should be done in China at the moment?

EC

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Chinese culture varies, and ways of interpretation have always been different from the West's. It can also be very different, in some aspects, to Hong Kong, Taiwan, Malaysia or Singapore. There's a famous study by Richard Nisbett about the formal differences between the East and the West, and I found this one sentence quite striking: 'Westerners are inclined to attend to some focal object, analysing its attributes and categorizing it in an effort to find out what rules govern its behaviour; East Asians are more likely to attend to a broad perceptual and conceptual field, noticing relationships and changes and grouping objects based on family resemblance rather than category membership.'

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That means there are definitely implications in our design of accessibility for digital copies. We exhibited a VR reconstruction of a Yuan Dynasty Seaport at last year's China Cultural Industries Fair. Whilst the participants were interacting with the virtual objects, they tended to break some of them (virtually), and an elderly man walked by and stated they were breaking China's national treasures. So you can see that people assign certain meaning and importance to virtual objects, even though they know that it is virtual. Having said this, there has not been much formal study of how Chinese culture perceives reproductions and copies. We're working on a Silk Road project which will attempt this, however, by evaluating differences in perception as it moves from China across Central Asia to Europe.

AA Interesting. Can you tell us more about the project?

EC The Silk Road project was born out of an observation that most cultural heritage objects are mainly interpreted, evaluated, and communicated by experts. But there also exists within the homes of many Chinese citizens, collections of objects which are handed down from generation to generation, which are not formally analysed by experts, but do contain very good personal histories. So, for example, a museum expert might grade an object by saying that it dates to the Ming Dynasty and it has certain attributes notable in design history. But I could come along and say, 'This belongs to my friend's father, who took it from this one place and brought it to another place', and make a case for why that is important. So there is a lot of contextual history embedded in every object which we could crowdsource. This project is mainly about communication. We crowdsource objects from the homes of people along the Silk Road and record their personal histories, and make it accessible to both experts and the general public.

This will be a digital project based on the use of photogrammetry. We're going to create an app which allows people to take multiple pictures of an object which then get sent to our servers. From there we can process them into digital models. If we can collect 1,000 objects, crowdsourced from anybody with a mobile phone, then museums might be able to identify 100 of them as having some added value beyond the contextual story. So, by conducting a massive survey of this sort, it gives us the opportunity to discover some quality objects, directly from the homes of people.

AA I think it's really interesting, because somehow it accelerates and amplifies the work that a curator or researcher could do, searching out interesting objects. It gives a new agency to people to contribute and participate.

BC Do you think there's an appetite amongst an audience to know the stories of the users more than the stories of the designers, or other stories that a curator mighty typically tell?

EC

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In China, people love a good story. If you have an object that you can tell really compelling stories with, it will become really meaningful and get shared across social media. Stories are the real value of objects. The fact that the Silk Road project is a crowdsourced social database, every object is embedded with a level of social interaction. Especially in this cross-border Silk Road region, you want objects to be able to bring people together through stories.

BC Could you discuss a little bit more about the kind of directions you see 3D technology going as a tool for interpretation? What are some of the projects that excite you?

EC

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I have two PhD students starting projects this year which are really interesting. One explores using a mixture of virtual reality and augmented reality to look at how digital copies of heritage artefacts can become both a gateway and a place. By gateway, I mean a kind of time machine. By accessing objects via augmented reality, you can see the object as itself, but you can also view the object in a completely immersive virtual environment, bringing you into the context, the history, and the environment associated with the object. The second aspect is about the object as a place, a space for interaction with layers of embedded information, including history, social interaction and citizen interpretation. Open museum collections allow for more global access and cross-border communications, but there is a need for new ways of accessing cultural heritage, and to repurpose the information available by using state-of-the-art immersive technology.

The other project looks at collecting and documenting the near past. If you look at the UNESCO World Heritage list, most sites date from 100 years ago to 5,000

years ago. Within the past 100 years, there are very few sites, with the youngest being 39 years old: the Sydney Opera House. The 'near past' as I like to call it, this period between the present and the limit of where memory still exists, is not really recorded. For example, certain objects belonged to my grandmother. If she hadn't died, I would have asked her a lot of questions about them, and recorded their histories. <u>When memories are still alive, there is an urgency to collect and record them</u>. Once the memory is gone, we have lost them forever. So, I'm very excited with this project, which looks at the nostalgia induced by memories of the recent pasts, through objects, or digital copies of it via Virtual Reality or Augmented Reality.

AA     What are your thoughts about doing all this great work pushing the boundaries of what digital can do for museums, when half of the population still has no access to the Internet? Do you see it improving?

EC     It's true that half the population of the world doesn't have access to the Internet. However, this is improving, and will continue to improve in the future. A UN report last year stated that there has been an increase from 43% in 2015 to 47% in 2017 of global Internet users. So you see a positive trend in the right direction. What I worry about instead is not having net neutrality, and this is perhaps a more serious issue. Our cultural heritage needs to be made as accessible as possible, especially as a source of inspiration for the creative industry, which is the fastest-growing in the world. Whilst the Internet is used by more and more people, we have to look at local issues, what each country is doing specifically about preserving and supporting net neutrality.

BC     You stated in a talk at our ReACH discussion in Beijing 'the need for the curation of the entire integrated systems used for executing digital artworks and digital cultural heritage, which often extends beyond software to include hardware interfaces.' I think it's a provocative sentence, could you expand on it?

EC     Digital copies of objects and their metadata are very easy to store, because you have well-established file formats, such as .obj files. However, copies of cultural heritage are not just singular objects, but are potentially entire systems. I'll explain with an example: let's consider a properly laser scanned high-quality 3D model for a virtual reality version of the Yuan Dynasty Seaport. This involves many objects embedded within a system which connects the virtual environment with the position of the object, the scenery, the atmosphere, if it's raining or not, the gravity of the object and so on. But that system is also the devices used for accessing these objects, such as an HTC Vive, or an Android mobile phone, or an iPad, etc. All these things are one single system which is, in fact, a copy of history. So, if I let you into my virtual

world, with all the objects involved, my virtual world is integrated as a system of hardware and software and objects, housed within an operating system within a computer which works now in 2018.

In 2019, my system could still work, but if Apple or Windows changes its plug-ins, or if the software company Unity or Unreal goes bankrupt, then my copy of the Yuan Dynasty Seaport will become no longer accessible. So, it's not just file formats which we're looking into, it's the entire system, because we're not only copying objects, we're copying history. I consider the entire system of reproduction as a copy that needs to be preserved.

BC     So the digital projects we do now are going to become historical objects that need to be preserved in their own right.

EC     Yes, and this applies to artworks, too. I am not a famous artist, but I do create mixed-reality art, which involves hardware and software. If you have a very prominent artist creating a mixed-reality artwork, then certainly, this artwork will become valuable in the future for curation. How do you preserve this for future viewing, is the question.

AA     In your view, what are the big obstacles we will have to overcome in the future, as museums become increasingly digital?

EC     Unlike the twentieth century, the twenty-first century is highly connected, with millions of users, and an overwhelming amount of content. And we're producing more content every day. The large corporations, especially Google, Facebook, Alibaba and WeChat, have captured massive audiences. But sustaining a global audience amounting to billions of users requires that huge technical challenges be overcome. Those challenges are about big data, parallel processing capability, modes of interaction, input and accessibility. Simply put, the volume and the velocity of data coming in is the greatest challenge ahead. But I am optimistic.

01
Virtual reconstruction
of a village in Doggerland
during the British
Mesolithic Period.



01



03

02



02
VR exploration of
an ancient house
reconstructed using
a combination of
photogrammetry and 3D
modelling techniques.

03
The virtual hand of a VR
user attempting to open a
door at the entrance of an
ancient Chinese piece of
architecture.

04
A mobile augmented
reality application showing
a 3D copy of a 'Sancai'
ceramic tomb figure of a
camel made of brown-and-
green glazed earthenware
from the Tang Dynasty.



05

05
A young participant
exploring the VR
reconstruction of an
ancient maritime port
in China.

06
A bronze sculpture of
a beast guarding the
gates of Beijing's Palace
Museum. The digital 3D
copy is on the right.





04        06

# Project Profiles

# Sites éternels

PARIS, FRANCE
2016

An exhibition using scans and AR to
allow museum visitors to experience
hard-to-access sites.



*Sites éternels* was an exhibition organized by the Grand Palais and
the Louvre, Paris, opened in 2016 under the patronage of UNESCO.
The exhibition explored four inaccessible archaeological sites:
Khorsabad in Iraq, Palmyra and the Umayyad Mosque in Syria and
Kerak Castle in Jordan. The curators worked with Iconem to produce
several detailed scans of the sites, which were then used in various
ways in the exhibition space to create immersive environments.
Such tactics included large-scale wall projections that recreate the
architectural environment, augmented reality accessed through
your smartphone and a partnership with Google Arts & Culture to
disseminate more information about the sites online.

# Reconstructing the *Triumph of Amphitrite*

LONDON, UK
2016

A reconstruction of a fountain using digital scans of moulds.

In 1870, the V&A acquired an incomplete version of the *Triumph of Amphitrite* table fountain made in Meissen, meaning it was impossible to display the work in its complete form. For the opening of the new Europe Galleries at the museum in 2015, the missing parts were refabricated using a mixture of traditional and modern techniques, allowing for a complete version to be displayed for the first time in 2016. Original moulds, kept in the archives of the Meissen factory near Dresden, were 3D scanned, from which new models were printed. Replacement moulds were made from these and used to recreate the missing porcelain pieces. This process demonstrates how new fabrication technologies can complement and augment traditional methods of reproduction.

# Rijksstudio Award

AMSTERDAM, THE NETHERLANDS
2014–PRESENT

A competition encouraging people
to re-appropriate the Rijksmuseum
collection.



The Rijksstudio Award was launched in 2014 by the Rijksmuseum
as a way to stimulate and encourage the creative re-use of digitized
imagery from its permanent collection. The museum famously
launched its Rijksstudio in 2012, a platform for searching through and
downloading high-resolution images from its collection. The award is
organized annually, and encourages people to submit new creations
based on downloaded content from their website. The winner is given
a €10,000 cash reward as well as the opportunity to display their
creation in the museum. Past winners have included sleeping masks
with the imprint of eyes from famous portraits, a make-up line inspired
by five women's portraits, a wallpaper collection, a Delft blue hat and
a Rembrandt Book Bracelet.

# Public Datasets
# on Google BigQuery

MOUNTAIN VIEW, USA
2010–PRESENT

A platform of usable public datasets
to analyse and cross-reference.



Google BigQuery is a web platform that enables users to analyse
very large datasets online. The site offers several datasets that are
completely open to the public, including weather data going back to
1763, 3.5 million digitized books, sports statistics, a dataset of worldwide
news and an image database. Users can cross-reference various
elements of these datasets to generate useful insights. For instance,
weather data can be paired with data about motor vehicle collisions in
New York City to understand the adverse effects of weather on road
safety. With museums releasing more and more of their collections
online, an opportunity arises for vast swathes of image-related metadata
to be analysed at a scale never seen before, creating new revelations
about the history of our visual culture.

# Authors and Interviewees

ANAÏS AGUERRE is Project Director for ReACH. She is also Founder of Culture Connect Ltd., a consultancy practice specialized in unlocking the international potential of the cultural sector and its ability to build bridges between people, institutions and countries.

EUGENE CH'NG is Professor of Cultural Computing and Director of the NVIDIA Joint-Lab on Mixed Reality at the University of Nottingham Ningbo China campus.

BRENDAN CORMIER is a design curator at the V&A, as well as Lead Researcher for ReACH. In 2016, he curated *A World of Fragile Parts* for the Venice Biennale of Architecture, looking at how copies can be used to preserve culture.

CHANCE COUGHENOUR is Program Manager at Google Arts & Culture, coordinating cultural heritage preservation efforts. He organizes partnerships and leads projects which employ emerging technology for cultural heritage documentation and dissemination.

MARION CRICK is Head of Collections Management at the V&A. She is currently leading the project 'Content/Data/Object', which looks to articulate concepts around digital collections to inform policies and protocols.

ABRAHAM DRASSINOWER is Professor at the University of Toronto's Faculty of Law and Chair in the Legal, Ethical and Cultural Implications of Technological Innovation. He is Counsel to Torys LLP providing advice on intellectual property.

DAVID GISSEN is Professor of Architecture at the California College of the Arts and a historian and theorist with a specialty in environmental histories of architecture, landscape architecture and urbanism.

LAURA JONES is International Coordinator of Culture in Crisis at the V&A.

MARI LENDING is a professor in architectural theory and history and a founding member of OCCAS (the Oslo Centre for Critical Architectural Studies). She is the author of *Plaster Monuments: Architecture and the Power of Reproduction*, published by Princeton University Press in 2017.

ADAM LOWE is the founder of Factum Foundation and Director of Factum Arte. He has been pioneering the application of technology to the recording of cultural heritage since 2001, when the first high-resolution laser scanning was carried out in the Tomb of Seti I.

MARK MUDGE is President and co-founder of Cultural Heritage Imaging (CHI) and the current Chairman of the Board of Directors.

WIM PIJBES is the former Director of the Rijksmuseum in Amsterdam, where he oversaw the museum's complete refurbishment and reopening in 2013. He is currently Managing Director of the philanthropic foundation Stichting Droom en Daad.

VERNON RAPLEY is Director of Cultural Heritage Protection and Security at the V&A. He oversees the Museum's Culture in Crisis Programme. He also worked for nearly a decade as the Head of Scotland Yard's Arts and Antiques Unit.

LOIC TALLON is Chief Digital Officer at the Metropolitan Museum of Art in New York City. Prior to joining the Met in 2013, he was Director and Founder of Pocket-Proof, a strategy and design consultancy specialized in mobile user experience.

MERETE SANDERHOFF is Curator and Senior Advisor of Digital Museum Practice at Statens

Museum for Kunst in Copenhagen. She works for free access to and re-use of digitized collections. This aspiration also drives her work as chair of the Europeana Network Association.

CARLA SCHROER leads the training programmes at Cultural Heritage Imaging, as well as working on field capture projects with Reflectance Transformation Imaging, photogrammetry, and related computational photography techniques.

SANDRA L. LOPEZ VARELA is a full-time Professor at UNAM, Mexico. She held the Archaeology Seat at the American Anthropological Association from 2011 to 2014; and was President/Vice President of the Society for Archaeological Sciences from 2007 to 2011.

DIANE ZORICH is Director of the Smithsonian's Digitization Program Office (DPO), where she leads an expert team in digitizing Smithsonian collections to maximize their impact for the public.

# Notes

**Page 41**
PRESERVED IN PLASTER
Mari Lending

1. As noted in handwriting in the Inventory of 1868, bought for £10 each ('All subsequent copies £6 each'). Numbered '68.-10 and '68-11, V&A Archive. The production and purchase of the portals were described the next year in South Kensington Museum 1869, p. 36.
2. Wyatt and Waring 1854, p. 100.
3. Swenson 2013, p. 149.
4. The catalogue description of the 'portails des églises de bois de la Norvège à Urnes, Sauland et Flaa' invokes Byzantine monuments, Carolingian manuscripts and arabesques, the portals of the Chartres and Saint-Denis cathedrals, as well as Irish ornamental art. Enlart 1911, p. 143.
5. Rousseau 1902, pp. 30 and 32.
6. The sales revenue provided a surplus after covering the actual costs of the production of 'these beautiful and scientifically valuable casts'. Holmboe 1908, p. 13.
7. Letter from Haakon Shetelig to the Director of the Victoria and Albert Museum, 18 June 1907. V&A Archive.
8. Letter from Shetelig to Reginald Smith, 7 July 1907. V&A Archive, MA/1/B1188.
9. South Kensington Board of Education 1908, p. 11. Robinson et al. 1908, entries 1596–9.
10. Letter from Edward Robinson to the Director at the Bergen Museum, 5 July 1907. Correspondence Archives, University Museum of Bergen.
11. Letter from Haakon Shetelig to V&A, 18 June 1907 and several notes in a minute book dated 1907. V&A Archive, MA/1/B1186.
12. Letter from Haakon Shetelig to Gabriel Gustafson at the Historical Museum in Oslo, 19 December 1907. Copy book 1907–9, Correspondence

Archives, University Museum of Bergen.
13. Arrhenius 2012, p. 140.
14. *Skilling-Magazin*, 5 April 1845.
15. Letter to the Director at the Metropolitan Museum of Art from Haakon Shetelig, 1 June 1907. Met Archives.
16. Letter from John W. Beatty to Gabriel Gustafson, 13 August 1906. Carnegie archive.
17. Letter from Gabriel Gustafson to John W. Beatty, 6 August 1906. Carnegie archive.
18. Letter from Gabriel Gustafson to John W. Beatty, 19 October 1906. Carnegie archive.
19. Letter from Gabriel Gustafson to John W. Beatty, 6 August 1906. Carnegie archive.

**Page 51**
CHANGING ATTITUDES TO PRESERVATION AND NON-CONTACT RECORDING
Adam Lowe

1. Grosvenor 2017.
2. Mayes 1959, p. 293.
3. These local partners are as follows: AFGHANISTAN: Afghan Cultural Heritage Consultation Organization (ACHCO); EGYPT: The Tarek Waly Centre for Architecture and Heritage and the Theban Necropolis Preservation Initiative (TNPI); IRAQ: The University of Mosul and the office of the Mayor of Nineveh; JORDAN: Community Jameel and Columbia University LEBANON: APSAD and the Arab Image Foundation; TUNISIA: Institut National du Patrimoine (INP) SYRIA: The Association for the Protection of Syrian Archeology (APSA2011); LIBYA: Department of Antiquities; OCCUPIED PALESTINIAN TERRITORIES: The Palestinian Museum, Birzeit University, the Qattan Foundation

and RIWAQ; SAUDI ARABIA: Community Jameel and MISK DAGHESTAN: Peri Foundation and Juma al Majid Centre for Heritage and Preservation; NIGERIA: The Trust for African Rock Art (TARA) and Calabar University Chad: The Ministry of Tourism and TARA; BRAZIL: People's Palace Projects and Kuikuro People of Ipatse Village

**Page 101**
PRESERVING THE DIGITAL HOUSE OF CARDS
Marion Crick

1. https://www.nationalarchives. gov.uk/PRONOM/Default.aspx (accessed 15 December 2017).
2. http://www.3d-coform.eu/index. php/3d-content/x3dom-for-3d-coform (accessed 15 December 2017).
http://www.vam.ac.uk/blog/digital-media/restoring-the-digital-dead (accessed 15 December 2017).
3. https://beagrie.com/krds.php (accessed 31 January 2018).

**Page 141**
REMARKS ON MUSEUMS IN COPYRIGHT
Abraham Drassinower

This is a slightly modified version of a talk delivered at the ReACH (Reproductions of Art and Cultural Heritage) Roundtable at the Smithsonian Institution, 19 July 2017. With thanks to Anaïs Aguerre, Brendan Cormier and Jevgenija Ravcova of the V&A for the opportunity to participate in the discussion; to Bruce Chapman, Ariel Katz and Arnold Weinrib for conversations on the topic; and to Nathaniel Bryan for research assistance.

1. *Copyright Act,* RSC 1985, c C-42, s. 30.1 (Can.) [*Act*].
2. *Act,* s 2.
3. See, for example, *CCH Canadian Ltd v Law Society of Upper Canada,* 2004 SCC 13 [*CCH*].

4. *Feist Publications Inc. v. Rural Telephone Service Co. Inc.* 499 U.S. 340 (1991), 361.
5. *International News Service v. Associated Press* 248 U.S. 215 (1918), 250 (Brandeis J.).
6. *Act,* s. 30.1(1)(f): 'It is not an infringement of copyright for a library, archive or museum or a person acting under the authority of a library, archive or museum to make, for the maintenance or management of its permanent collection or the permanent collection of another library, archive or museum, a copy of a work or other subject-matter, whether published or unpublished, in its permanent collection … … if necessary for restoration.'
7 *Act,* s. 2. C.f. the 2007 definition formulated by the International Council of Museums, and cited in the 'Statement by the International Council of Museums Concerning Exceptions to Copyright' (available at http://icom.museum/uploads/media/declaration_copy_WIPO_ICOM_eng.pdf) presented in December 2015 at the 31st session of the Standing Committee on Copyright and Related Rights of WIPO (World Intellectual Property Organization): 'A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment.'
8 On the work of authorship as discourse, see Drassinower 2015.
9 *Act,* s. 2.

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CULTURAL HERITAGE AND THE DIGITAL DIVIDE
Sandra L. López Varela

1. ITU 2017.
2. United Nations 2017.
3. Bindé 2005.
4. Escobar 1995.
5. ITU 2017.
6. United Nations 2017.

7. ITU 2017, p. 179.
8. Ibid., p. 18.
9. ITU ICT Data and Statistics Division 2017.
10. ITU 2017, p. 18.
11. INEGI 2017.
12. ITU 2017, p. 18.
13. INEGI 2017.
14. Ibid.
15. Deloitte 2017.
16. ITU ICT Data and Statistics Division 2017.
17. Ibid.
18. Giaccardi and Palen 2008.

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REACHING OUT TO THE WORLD WITH OPEN ART COLLECTIONS
Merete Sanderhoff

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16. https://medium.com/smk-open/danish-art-takes-netflix-be58ccd405e2 and https://en.wikipedia.org/wiki/Alias_Grace_(miniseries).
17. Since we added information about the featured SMK artworks to the article on the Alias Grace TV-series, those artworks have been viewed close to 870,000 times – in January 2018 alone.
18. https://www.shapeways.com/blog/archives/35798-magic-happens-designers-get-open-access-great-works-art.html (interview in video).
19. This passage is adapted from my article '*Wanna play?*' (Sanderhoff 2015). https://medium.com/code-words-technology-and-theory-in-the-museum/wanna-play-8f8e2e8cb2fe.
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**Page 203**
ENVIRONMENTAL REPRODUCTIONS
David Gissen

1. Jennifer Stager and Richard Crowley both explore the environmental implications of this ancient reproduction. See Stager 2018 and Crowley 2016.
2. See Thompson 2016, and for historical comparison, Klamm 2017.
3. Klamm 2017.
4. Chalmers et al. 2009.
5. Uchill 2015.
6. Benjamin 2010.
7. Panofsky 2011, p. 331.
8. Brandi 2007.
9. Compare the spectra of this latter reproduction to the mostly pure-white reproductions of classical sculpture shown in the other figures.

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