

Adam Lowe

## FROM THE RECORDING OF A PAINTING TO THE RECORDING OF AN ISLAND

*The re-production awakens the original*

In 2006 I received a call from Bruno Latour, followed by an email from Pasquale Gagliardi. That was followed by a visit to an island I had not been to for 20 years, since playing in a football match against Radio San Marco. When I met Pasquale, it became clear that there was a vision to rejuvenate this island through the history and culture it contained. There were dissenting voices who understood the commercial potential of the island as a leisure facility, but within the Fondazione Cini there was the potential to do something that could change the role of culture and move it beyond its role as a magnet for tourism. This short introduction to the collaboration Factum has developed with the Fondazione Giorgio Cini is an opportunity to map the changes that have taken place. Fixed ideals of originality have been transformed into a shared and accessible concept of authenticity. Originality is a dynamic process and everything that follows is a celebration of that process.

1. *Tonal map of the island of San Giorgio Maggiore*

### THE UNVEILING

A vast network of artists, historians, technicians, and countless others, few of them known to one another, aggregate for the startling task, not of transcribing a 67m<sup>2</sup> painting almost half a millennium old, but of recreating it, re-originating it through many thousands of agonizing decisions, at dizzying degrees of fidelity. But fidelity not to some static original, but to a “trajectory of transformations” set loose in the constantly changing run of social time. To fill a refectory wall at the height of the Renaissance with an ancient story of renewal is an act of mastery, faith, cohesion, exuberance, and conviction. To restore that same wall with that same painting of that same ancient episode – after Darwin, after Hiroshima, after the launch of interplanetary probes, after decolonization, after the onset of global warming and mass extinction, after nano-computing, after the discovery of the molecular basis of life – and to do so with

technologies that have broken free of any individual's ability to understand, now becomes an act of near-perverse regeneration. Those who had lost the ability to see anything at all in the aura-laden original will look again. New gatherings will be refreshed. Future pasts will be reformed. The reproduction awakens the original.

Richard Powers, "Making things Similar", a short story about making the facsimile of Veronese's painting *The Wedding at Cana*, read by the author at the *Dialogo di San Giorgio*, 2008.<sup>1</sup>



[2.]

September 11th, 2007. It was dusk, and a hushed crowd packed the Palladian refectory on San Giorgio Maggiore. Salvatore Settis had just completed his talk.<sup>2</sup> The curtain covering Veronese's vast canvas fell away and anticipation gave way to raw emotion. An exact facsimile of *The Wedding at Cana* filled the end wall of the refectory, allowing the painting to be seen as originally intended, echoing, engaging with, and extending the architectural details of Andrea Palladio's building and puncturing the solidity of the space with the illusion of another world. Veronese's painted representation of staggering complexity once again played with the architectural purity of Palladio's design. The multilayered painting, the size of a large cinema screen, indulges in the sensuality, pleasures, and riches of material life as if mocking the puritanical austerity of the Reformation.

There were cheers, excitement and animated talking among the audience, some were filming, and others were in tears... several experienced Stendhal syndrome, fully aware that they were seeing a copy.<sup>3</sup>

How was this possible? Was this response just an emotional outpouring at the healing of a gaping wound in one of the jewels of Venice? Was it something to do with a sense of identity and national pride? Was it that the *Gesamtkunstwerk* ("total artwork") was restored by reuniting the painting and the Palladian building for which it was painted and with which it is in dialogue on so many levels?



[3.]

#### AUTHENTIC OBJECT VS. AUTHENTIC EXPERIENCE

The original painting may still hang in Paris, but its "aura" has migrated back<sup>4</sup> to the building it occupied between its completion in 1567 and its removal in 1797. This new dynamic has provoked many questions, and some key themes have emerged that include originality and authenticity, restoration and preservation, sharing and ownership, restitution and repatriation, screen-based displays and physical digitally mediated presences, and on- and off-line communication. It also highlights the fluid nature of creation and the urgent need to act creatively to protect and communicate the importance of culture. In 2007 these were not the main points of focus. Some were not even on the agenda. A brief glance at a photograph of the unveiling of the facsimile and another taken in 2017 of the heavily restored original in the Musée du Louvre, where the painting hangs at the wrong height, in a vast gold frame under a zenithal light, is very revealing. These pre-pandemic images of human communication and sharing amplify the shifts that can happen over relatively short periods of time. In the refectory everyone was focused on – and transfixed by – the painting they knew was a facsimile. In the Louvre the only people facing – but not seeing – the painting are the ones taking "selfies" with the Mona Lisa behind them, just visible through bulletproof glass. The vast painting by Veronese, once considered one of the greatest works of the western canon, is effectively invisible as tourists tick the Mona Lisa off their cultural hit list. As Susan Tallman wrote in *Art in America*:



[4.]

Viewers today have a choice: they can go to the Louvre to see what is substantially, if not entirely, the canvas and pigments with which Veronese and his shop worked. Or they can go to San Giorgio Maggiore and see something (almost) visually identical to what is in the Louvre, though made of quite different stuff. The original hangs low on a wall at the Louvre, between two doors, in the same crowded gallery as the Mona Lisa. The copy at San Giorgio Maggiore hangs at the height and in the space for which it was intended, with the lighting anticipated by Veronese. There is no doubt which is the more authentic object. But which provides the more authentic experience is open to question (Susan Tallman, "The New Real. The Da Vinci Clone", *Art in America*, February 2009).

The media interest in the facsimile in Italy and beyond was immense and has continued to grow in academic and cultural circles. In 2008, during his television programme *Passepartout*, art historian Philippe Daverio threw his copy of Walter Benjamin's essay over his shoulder and declared that we need to renegotiate the relationship between the "object" and its "aura".<sup>5</sup>

#### CHANGING TASTES

As people engaged with the relationship between the room and the painting, a host of questions arose about the restoration of the refectory itself. In Vincenzo Maria Coronelli's engraving we get a sense of how it looked when in daily use by the monks. The engraving shows the practical function of the space as a dining room, where the daily restaging of the Last Supper played a symbolic role. The silence of monastic life and the absence of distracting conversation when eating, meant that a multilayered and complex composition, was required. Veronese and his team rose to the occasion creating a dynamic spatial symphony in which the eye is led around the surface using an array of pictorial devices. The compositional sophistication was one reason the painting was so revered. But by the end of the nineteenth century the small *Mona Lisa* had seduced fin-de-siècle Parisian taste and, a few years later, inspired Duchamp's *LHOŌQ*. Its celebrity was secured. Taste and interests change. Recently Beyoncé and JZ's "Apehit" video refocused attention on different aspects of many paintings in the Louvre. In it, they drew attention to the cultural complexity of Veronese's masterpiece and attracted a vast new audience to whom black lives matter.<sup>6</sup>

The synthesis of sensory allusions within the painting inspires and directs reflection. It is hardly surprising that Inquisitors were concerned to establish whether the subject was really the *Wedding at Cana* or *The Last Supper*. Luxury, opulence, architectural excess, taste, smell, and touch are kept in flux within the illusory space animated by music generated by the centre-stage quartet (portraits of Veronese, Titian, Bassano, and Tintoretto). The light of the building is another protagonist that fixes the painting in a specific time of the year. During late afternoon in the summer, the wall of the refectory and the wall of the painting have similar shadows, focusing attention on the left-hand side of the painting where the dynamic and unsettling relationship between the bride and groom, their respective dogs, and the characters that surround them suggest the complexity of social, human, and sexual relationships. In the refectory the illusory world of painting dominates the physical space of the building. Veronese's *Wedding at Cana* is a site-specific work. In the Louvre it has lost much of its meaning and context.

#### REPATRIATION AND MIGRATION

André Malraux led the call for the repatriation of Veronese's painting. Words are easy when you have no power. But once he became the French Minister of Culture, he

2. *The refectory before the installation of the facsimile and a projection of the Veronese painting onto the end wall. It was the failure of this projection to either capture the materiality of the painting or its relationship to Palladio's architecture that led to the creation of the facsimile*

3. *A crowd inside the Salle des États at the Musée du Louvre, facing the Mona Lisa*

4. *A crowd in the refectory of San Giorgio Maggiore, after the installation of Factum's facsimile*



[5.]



[6.]



[7.]



[8.]

informed his friend Vittorio Cini that return was impossible and that a request to repatriate the painting would not be considered. With the creation of the facsimile, it became clear that in this case repatriation was far from simple. With today's conservation criteria the "original" building and the "original" painting could not coexist. Both the painting and the building are major cultural icons, and both have different preservation and conservation requirements. For the painting to be returned, the refectory would need to be altered in significant ways that would both compromise the space and alter the experience. The facsimile, however, allows both to be seen as intended, although it is also clear that both have been significantly altered in material ways since their completion. The refectory is still (mainly) open to the cloister, is devoid of air conditioning, it is above a kitchen, and is regularly used for public events and dinners. There are no UV filters over the windows and the daylight is as intended by Palladio. The room in the Louvre is visited by over 9 million people a year. Over recent years it has also been used for music videos, advertising campaigns, and exclusive dinners.

Repatriation is one of the major topics of today, and again, France is at the centre of the debate. Bénédicte Savoy and Felwine Sarr's 2018 report commissioned by President Macron, *Toward a New Relational Ethics*, states that it "only concerns sub-Saharan Africa". The focus is on the quantity of objects that were removed and the abuses of colonial power rather than on finding new ways of owning and sharing. Napoleon is clearly the elephant in the room, the great trophy-hunter operating within a divided and fragmented Europe. Issues of repatriation tend, by definition, to be intertwined with financial power and national identity rather than cultural preservation. By not engaging with a deep discussion about the movement of objects within Europe (or within borders that have altered since the production of the object) the report fails to address the central issue; how do we access and understand culture both *on line* and offline and can the discussion about ownership go beyond the binary "yours" or "mine"? Objects are ambassadors as well as symbols and assets. Both people and objects migrate. Migration is at the core of the survival of Homo sapiens.

#### DIGITAL CONNOISSEURSHIP

Through each of the hundreds of initiatives carried out by Factum Foundation since its formation in 2009, it has become increasingly clear that originality is a process and objects develop complex personalities as they change over time and through human intervention. The Vatican Cartoons by Raphael in the Victoria and Albert Museum and the Black Paintings by Goya in the Museo del Prado have both been recorded in 3D and colour and with multi-spectral imaging. The data now exists and is waiting to be studied in-depth. This data holds the key to many questions that emerge the longer you look at and think about any object. Why are the Raphael cartoons pounced with such a fine network of pin pricks? They were made as tapestry designs to be woven on low-warp looms in Flanders. This process requires that they were cut into strips. For tapestry production, pouncing is not required. Were more sets of Cartoons produced from the ones in the V&A? Were the Cartoons in the V&A used to make the tapestries in the Vatican?, or the sets that still exist in Mantua or Madrid? Which tapestries were made from the cartoon fragments in Chantilly or Dublin? Goya's *Black Paintings*<sup>8</sup> provoke speculation on how they would have looked when they were painted directly onto the walls of the Quinta del Sordo. What changed during their removal? Who removed them and why? Are they blacker now that they were in Goya's lifetime? What role does their celebrity play in revealing or obscuring the achievements of Goya's late style? Imaging techniques play an important role in how we see works of art. Technologies

to see through the paint layers have been available for decades: X-rays, infrared reflectography, ultraviolet photography and other types of multispectral photography are in regular use. Modern techniques for material and pigment analysis add a forensic accuracy to the practice of "technical" art history. It is only recently that attention has focused on the surface of paintings. Digital technology has made it possible to record their topography, revealing the interconnected relationship between the image and the materials from which it is formed. The material qualities of an artwork's "skin" provide information about the hands that made it, the material used, the way it has aged over time and the diverse ways it has been looked after. The biography of a painting is an intrinsic part of its historic trajectory.

#### EXHIBITIONS ON SAN GIORGIO MAGGIORE: *THE ARTS OF PIRANESI*, 2010

The debate between material evidence and philology informed the exhibition *The Arts of Piranesi; Architect, Etcher, Antiquarian, Vedutista, Designer* that opened at the Fondazione Giorgio Cini in 2010 and toured to Madrid, Barcelona, and San Diego. Piranesi made, designed, and found objects for the grand tourists of the eighteenth century. He focused attention on the materiality that is intrinsic to things. His insistence on looking, asking questions, and treating the object as a complex subject became a theme that ran throughout the exhibition.<sup>9</sup>

It was the first of several collaborations between the Fondazione Cini, Factum and Michele De Lucchi.

The reason for the exhibition was to show the complete set of Piranesi etchings from the collection of the Fondazione Cini. But in the atemporal style that was starting to emerge on San Giorgio, the evidence of the past would merge with the technologies of today. Photographs taken by Gabriele Basilico restaged Piranesi's *Vedute di Roma*,<sup>10</sup> sometimes with surprising results as classical buildings now stand more complete than they were in Piranesi's time. Anastylosis was the fashion of the post-war years whose protocols were defined in the 1964 International Venice Charter. Rebuilding was the theme then after the destruction of the Second World War. Reuse is the theme today! Factum made an animated film of the Carceri that involved months of work by Grégoire Dupond.<sup>11</sup> The transformation of a two-dimensional image into a choreographed three-dimensional space still generates a viscerally intense experience. The exhibition also contained a series of objects made after designs by Piranesi selected by Alessandro Martoni, Michele De Lucchi, and me in conjunction with the leading authority on Piranesi's work, John Wilton-Ely. The objects primarily came from the series *Vasi, Candelabri, Cippi, Sarcofagi, Tripode* and from *Diverse maniere d'adornare i cammini ed ogni altra parte degli edifizii*.

Both the film and the objects have had independent lives since the exhibition. The potential impact of technology and its ability to revitalize cultural heritage was clear and met with great popular approval. The touring exhibition that followed generated revenue for the Fondazione Cini and demonstrated a new sustainable model for sharing and giving access to the Cini collection.

The show that is now being exhibited in Madrid, at CaixaForum, *The Arts of Piranesi; Architect, Etcher, Antiquarian, Vedutista, Designer*, is extraordinary. It has, among others, the merit of showing a good number of the objects that Piranesi conceived of and designed but never saw materialized as they were too eccentric and unusual for the taste of his contemporaries. They have been produced, with scrupulous fidelity and using the most advanced technology, by the workshop Factum Arte in Madrid (Mario Vargas Llosa, "El visionario," *El País*, May 5, 2012).<sup>12</sup>

5. Veduta del refettorio di San Giorgio Maggiore, in Vincenzo Maria Coronelli, *Singularità di Venezia e del suo Serenissimo dominio* divise in più parti, Venezia 1709, II (c. 119)

6. Visualization of the refectory with the floor of the painting continuing into the room and the light coming in from the windows on the right

7. Same visualisation of the refectory, with a lantern window appearing above the painting. Traces of this window can be seen on the outside of the building and is characteristic of many buildings by Palladio

8. Following the unveiling of the painting, a dinner was organized in which the arrangement of the tables mimics the one in the painting and the musicians echo the figures above

Other exhibitions followed. *Penelope's Labour; Weaving Words and Images* focused on the tapestries in the Cini Archives seen alongside new woven artworks by Grayson Perry, Manuel Franquelo, Alighiero Boetti, Maurizio Cattelan, Lara Baladi, Simon Peers, Carlos Garaicoa, and others.<sup>13</sup> The exhibition was rapidly put together to fill a cancellation that would have left the Sala de Convitto without an exhibition for the Biennale of Art in 2011. The result, curated with Jerry Brotton, was spontaneous and seductive. It was another demonstration of the diverse ways in which the Cini collection could dialogue and inform today's artistic production. The recording and study of tapestries and Jacquard weaving are increasingly important areas of investigation. Vittorio Cini's tapestry collection will hopefully be the focus of an ARCHiVe research project over the next few years.



MINDFUL HANDS, 2016

*Mindful Hands; Masterpieces in Illumination from the Cini Collection*<sup>14</sup> was another collaboration with Michele De Lucchi and Factum that took place in the Sala de Convitto in 2016, when more than 120 works from one of the most important collections of Medieval and Renaissance miniatures were displayed publicly. Vittorio Cini acquired the collection from the Libreria Antiquaria Hoepli in Milan in 1939-40 and presented it to the Fondazione Cini in 1962. The collection was originally formed by Charles Fairfax Murray who was close to both William Morris and John Ruskin. It is predominantly made up of illuminated pages removed from manuscripts, including works from the main Italian schools and some of the most pre-eminent illuminators from the twelfth to the sixteenth centuries. Among the works exhibited was the *Offiziolo di Carlo VIII*, commissioned by Ludovico il Moro from the workshop of Giovanni Pietro Birago. The miniature *Book of Hours* (6 x 3cm) consists of 422 pages of exquisite illumination and inventive typography. The colour and condition of the images was remarkable, but for obvious reasons the original could not be handled in the exhibition. A decision was taken to make a 1:1 facsimile that could be displayed alongside enlargements of the jewel-like paintings. The manuscript and its binding were recorded using a specially designed system with a mirrored glass prism. The manuscript was never open at more than 45 degrees and the binding was never forced. A facsimile was produced that could be handled by the public during the exhibition. It was exhibited alongside a film by Luke Tchalenko<sup>15</sup> revealing every stage in the process of making an illustrated manuscript from the flaying of a goat, through all the stages of the production of vellum and pigment to the binding of books.

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POLITTICO GRIFFONI, 2020

The most recent exhibition took place not on the island, but at Palazzo Fava in Bologna in March 2020. It focussed on the extraordinary Bolognese altarpiece, the Polittico Griffoni, which was painted in 1471-72 by Francesco del Cossa and Ercole de' Roberti. Between 2012 and 2018 Factum worked to record and replicate all 16 original panels of the polyptych and to reunite them for the first time since they were sold off in the eighteenth century. The complete recording of the panel paintings resulted in both the re-unification of the original panels for the exhibition in Palazzo Fava and an in-depth study by Cecilia Cavalca and Mauro Natale.<sup>16</sup> The recording began with the 3D scanning and photography of three small panels from the altarpiece by Ercole de' Roberti,

now in Vittorio Cini's collection in San Vio. These were the first paintings in the Cini Collection recorded by Factum using the Lucida Scanner (which was designed, built, and programmed by Manuel Franquelo and Factum's 3D recording team). The recordings of more paintings followed, but there are still several years of work ahead to ensure that the collection is fully documented and available *on line* at high-resolution.<sup>17</sup>

This initial session in the Fondazione Giorgio Cini led to the complete recording of all known parts of the Polittico Griffoni in the National Gallery (London), the Pinacoteca di Brera (Milan), the Pinacoteca Vaticana, the Musée du Louvre (Paris), the Museum Boijmans Van Beuningen (Rotterdam), Museo di Villa Cagnola (Gazzada), Pinacoteca Nazionale (Ferrara), and finally the National Gallery in Washington. The two paintings in the Brera were recorded both before and after restoration. The exhibition in Bologna was open for almost a year as a result of the Covid restrictions and it resulted in the publication of two books: *Il Polittico Griffoni rinasce a Bologna: La riscoperta di un capolavoro* which focusses on the importance of the altarpiece, while *The Aura in the Age of Digital Materiality: Rethinking Preservation in the Shadow of an Uncertain Future* considers the philosophical implications of Factum's work in merging digital technology and preservation from many different points of view.<sup>18</sup> The subtitle was intended to refer to the risks faced by both nature and culture, but it took on a deeper meaning with the arrival of the pandemic and the lockdown restrictions that were introduced the day the exhibition was due to open. Climate change, the lack of resources, natural disasters, terrorism, mass tourism, and war are just some of the urgent reasons why there has never been a more critical time to apply technology to preservation. We have the technical means to do so much but we require political will and action.

#### ARCHiVe – THE ANALYSIS AND RECORDING OF CULTURAL HERITAGE IN VENICE (2018)

The model that has been launched at ARCHiVe (The Analysis and Recording of Cultural Heritage in Venice) by the Fondazione Giorgio Cini in collaboration with Factum Foundation and EPFL brings together philology, recording and the analysis of data. This mix of knowledge and technology is urgently required. Gianluca Vacca, Undersecretary, Ministry of Cultural Heritage. In the forward to *Antonio Canova. Atelier*, edited by Chiara Casarin, 2019<sup>19</sup>

The creation of the facsimile of Veronese's *Wedding at Cana* led to the recording of many different parts of the extraordinary, diverse archive of works of art held on the island of San Giorgio Maggiore. Since 2006, the collaborations between the Fondazione Giorgio Cini, Factum Arte and Factum Foundation have continued to grow in both scale and ambition. ARCHiVe is the most ambitious yet.<sup>20</sup>

In June 2018, the Fondazione Giorgio Cini, the Factum Foundation for Digital Technology in Conservation, and the Digital Humanities Laboratory of the École Polytechnique Fédérale de Lausanne (EPFL-DHLAB) created ARCHiVe – the Analysis and Recording of Cultural Heritage in Venice, with the Helen Hamlyn Trust as supporting founder.<sup>21</sup> The 1,000 m<sup>2</sup> facility above the Stanze del Vetro, is dedicated to the development of hard- and software to be used in the preservation of the cultural heritage on the island of San Giorgio Maggiore in Venice and elsewhere.

From its conception, the aim was to ensure secure, long-term archiving while helping other institutions and organizations to benefit from the knowledge developed in the centre. Even before the formal establishment of the centre in its own designated space, Factum had been working with the Digital Humanities Lab at EPFL to build a system

9. The Wedding at Cana was painted by Veronese for the Refectory on San Giorgio. That the Refectory is still used for events was central to many of the arguments for not returning the original painting to Venice. Ironically, the facsimile is now visited by millions every year while the Lovure transforms itself into a dining room for Moët Hennessy Louis Vuitton (LVMH) where a handbag was recently displayed in the same vitrine that holds Leonardo da Vinci's Mona Lisa (LVML)

10. Peter Greenaway's projection onto Factum's facsimile of The Wedding at Cana, 54th Venice Biennale 2011. Almost 20,000 spent 40 minutes standing in the refectory as a video mapping projection animated the complex composition of the painting

11. The Siege of Jerusalem, c. 1480



[12.]



[13.]

to record the whole of the Fondazione Cini's photographic archive of paintings from the Veneto. This system was named the Replica 360 recto/verso scanner. It gave its name to "The Replica Project" that has successfully digitized more than a million A3, double-sided documents at 1:1 scale with a resolution of 700 DPI. The operating software automatically links the front and back of each item and establishes the system for metadata tagging. The recording of the collection of notated images was accompanied by experimental research into an image-based software by the team at EPFL. The aim was to use intelligent, machine-learning systems to search the archive in new ways. The work is ongoing. At the time of writing two technicians from Factum Foundation have just installed a second Replica system to record the Italgas archive in Turin and initial training has taken place to transfer the skills and knowledge required for the recording and secure, accessible archiving.

From this mix of technology, recording, analysis, and archiving, new areas of study are emerging. The work is ongoing and the themes are being defined. They include condition monitoring; repatriation; in-depth analysis and research; multi-layered archives; access to inaccessible sites and objects; reuniting objects with their intended location or as they were intended to be seen; assisting in museum loans and ownership issues; providing new opportunities for exhibitions, theatrical interventions, and diverse forms of display; digital restoration; recreating lost objects; transferring skills and technologies; providing long-term stable archiving, generating raw data for machine learning and AI... The list grows as the project continues.

#### DIGITIZING AND INTERPRETING THE CINI ARCHIVE

The digitization and study of the vast and varied collections within the Fondazione Cini was always at the heart of the work carried out by ARCHiVe. Under the direction of Andrea Barbon, work began to record the Tiziano Terzani Archive, the Sanskrit collection of Indian musicology donated by Alain Daniélou, the Seguso Vetri d'Arte Archive, the Ettore Sottsass Jr Archive, the Rolandi collection of opera librettos, the Essling collection of early printed books, the digitization of renaissance Italian woodcuts, and many other initiatives with the different institutions that make up the Fondazione Cini.

The inter-university research project Atlante Linguistico Mediterraneo was also launched by Andrea Barbon while Factum initiated a research project with Case Western Reserve University in Cleveland Ohio to analyse 3D recordings of the surface of paintings. The work with Machine Learning (ML) is leading to the "reading" of the properties contained in high-frequency 3D data. Software development has been undertaken by all the partners within ARCHiVe. Controlling the tools that are being used is essential for the next generation of digital recording and sharing knowledge and experience.

12.  
Gregoire Dupond recording the *Offiziolo di Carlo VIII* using the Miniature Book Scanner, designed by Dwight Perry

13.  
Display case within the Mindful Hands exhibition, with raw materials and a spectrum

14.  
Ercole de' Roberti, *St George*, 1471-72, Venice, Galleria di Palazzo Cini

15.  
Ercole de' Roberti, *St Jerome*, 1471-72, Venice, Galleria di Palazzo Cini



[14.]



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The ARCHiVe Online Academy is growing.<sup>22</sup> The courses offered, which are free and open to all, are aimed at transferring skills and technologies to archivists and interested practitioners. The on line activities are also supported through targeted practical workshops using a “learning by doing” model. The practical workshops have included partnerships with institutions like GSAPP (Graduate School of Architecture, Planning and Preservation) at Columbia University, New York; Iuav (Istituto Universitario di Architettura di Venezia); ISIA (Istituto Superiore per le Industrie Artistiche), Urbino; UPM (Universidad Politécnica de Madrid). Additionally, lectures and masterclasses on the topic of digital preservation have been given at Università di Bologna, ETH Zurich, Hong Kong University, Universidad de Zaragoza and Universidad de Alcalá de Henares. The connection between technology and craftsmanship is at the heart of these courses. The future of ARCHiVe is linked to the success of its on line presence, which will grow into a free educational resource as the lectures and workshops are recorded and can be downloaded on demand. The autumn 2021 courses were launched with a two-hour class introduced by the new Secretary General of the Fondazione Cini, Renata Codello and given by me and Frederic Kaplan. It focused on the complete recording of the island of San Giorgio carried out in June 2020.<sup>23</sup>



[16.]

RECORDING THE ISLAND OF SAN GIORGIO MAGGIORE

Venice was one of the first cities to experience the impact of Covid 19.<sup>24</sup> Not long after the 187 cm flood that did significant damage to the fabric of buildings on the island, the pandemic presented further challenges due to lost revenue and the restrictions that meant the foundation could not function normally. But it also presented a surprising opportunity. Without people, the complete recording of the island was suddenly a practical possibility. For years the digitization of Venice has been at the heart of Frederic Kaplan’s work. It is the ideal way to monitor the relationship between the land and the water while providing digital records to study and preserve the extraordinary heritage of the Venetian Republic. Mapping historical records onto 3D models in diverse ways is technically complex but first it requires accurate 3D recording. The challenge we set ourselves was to record 3D data at sub-centimetric (and ideally sub-millimetric) resolution and high-resolution colour data of all the structures on the island while exploring the possibility of incorporating and accessing different types of data at even higher resolutions. The result was an ARCHiVe research project that has had unexpected results.

Over a period of 12 days, three specialists from Factum took 25,000 photographs (each 61 megapixels) that were processed as a 3D model using Reality Capture software. Sixty billion measured points were recorded with a Leica LiDAR scanner from 600 different positions generating 2.6 terabytes of unprocessed data. In Madrid the team have spent hundreds of hours processing the data on three powerful computers using software including Unreal Engine 4 and Cyclone Register 360. The work was designed to raise questions and focus attention on what can realistically be done, how long it takes, and how much it costs. We did not manage to record the whole island, but we did record a large part of the built environment. We have been able to display this as a point cloud and we can render the data in different ways for different purposes. We can merge the LiDAR and photogrammetry and we can add links to other high-resolution 3D and colour data. We can present this as a form that can be seen but we cannot yet do it so that it can be streamed live as a single use experience in real time. That takes a significant amount of time and has financial implications. With a small fraction of the money

16.

*The Replica Scanner unveiled in 2016 during the launch of the Replica project, in collaboration with the Fondazione Cini and DHLab of the École Polytechnique de Lausanne (EPFL). The design was finished in Factum’s workshop in Madrid and on-site at the Fondazione Cini. The system has recorded more than 700,000 double-sided documents at 700 dpi*

17.

*First processing of the LiDAR data of the San Giorgio Maggiore facade acquired in 2020*

18.

*The digital data of the facade of San Giorgio Maggiore after merging LiDAR data and photogrammetry*

spent to build the Mose, ARCHiVe could plan and carry out a complete recording of Venice. It is a sad reality that the amount of money available for the development of computer games and within the entertainment industries is not there for heritage preservation. Both gaming and entertainment are dependent on teams of highly skilled people, render farms, expensive software, and cutting-edge display technologies. The initial recording of the island proved what is possible and, teamed with the right partners, how much could be achieved in a relatively short space of time.

The work that was carried out on the island has already found direct applications for studying and monitoring the speed of the salt damage to the stucco walls of the cloisters by Palladio and Andrea Buora, it has been used to create plans of the presidential rooms that are being used in the restoration of the building and it has facilitated detailed study of the furniture in the foundation. As the recording of both the island and its contents continues, the data will make the remarkable collections of the Fondazione Giorgio Cini accessible both on- and off-line. It will continue to raise questions and focus areas of research. As new technologies are developed, modified, adapted, and used, the volume of data will increase and its quality will improve. As with all ML and AI applications, the more information available the better the results.

One immediate new outcome of the recording of the island resulted from a radio interview in July 2020 on *The World*,<sup>25</sup> a popular news channel in the US. Factum was contacted by an innovative technology start-up from Boulder, Colorado. As a direct result, an ARCHiVe research project has been launched in collaboration with Divirod.

## AMPLIFYING THE HARMONICS OF WATER

Divirod’s advanced sensors monitor the relationship between land and water, with the data being accessible in real-time on desktop and mobile devices.<sup>26</sup> The small Divirod sensor that has been fitted to the window of the Foresteria (the beautiful rooms on the top floor of the Fondazione Cini that overlook the Santa Maria della Salute) is listening to the reflected energy from the signals emitted by every satellite that passes overhead. The radar reflection of satellite signals is used to detect unique signatures bouncing off the surface of the water. This provides a local, accurate, and dynamic image of the relationship between the fixed point of the land and the water. The cellular network uploads the signal to the cloud in real time where machine learning software aggregates and processes according to directions from the Divirod software. The result is highly accurate local data. The more sensors, the greater our understanding of the relationship between the land (a slow-moving but still dynamic body) and the water (a fluid that is animated by many forces from gravity, the moon, and wind to energy released by the passing of large boats). The accurate hydrological models generated from the harmonic recordings are used to create constantly updating representations of tide, wave activity, and wind speed that can predict erosion and flooding. The installation of the sensor in late August is part of ARCHiVe’s work to document and study both cultural heritage and natural changes on and around the island. This will be able to measure the rate at which the land is sinking alongside the complexity generated by a constantly rising and falling water level. More sensors will be installed on the island and on other buildings along the Grand Canal.

It is hoped that with time, this collaboration will link Divirod and ARCHiVe to Factum Foundation’s AALTO-SILO<sup>27</sup> project in Oulu, Finland, which will focus on the recording of natural heritage and the impact of human activity in the Arctic Circle. Venice is sinking at an estimated five millimeters a year. Oulu is rising at almost two centimeters a year due to “glacial rebound.” The Divirod sensors will play an important role in monitoring this change.



[17.]



[18.]



[19]



[20]

From its conception, the model for ARCHiVe is expansive and international. It was always seen as a nucleus that would provide a resource needed by many institutions around the world to whom recording, analysing and archiving information is of critical importance. This sharing model is growing and it's generating new areas of research. The next collaboration will be with the Bodleian Library in Oxford.

#### ARCHiOX — THE ANALYSIS AND RECORDING OF CULTURAL HERITAGE IN OXFORD

ARCHiOX (Analysis and Recording of Cultural Heritage in Oxford) is a research and development collaboration between the Factum Foundation and the Bodleian Libraries of the University of Oxford. It is directly linked to the ARCHiVe and it is also supported by the Helen Hamlyn Trust. The project is designed to provide a free exchange of knowledge that seeks to demonstrate the potential of non-contact digital technologies to the study of materials held by the Bodleian Libraries.

The ARCHiOX initiative will initially centre on the 2.5D recording of subtle marks on the surface of selected items from the Bodleian's special collections. After successful testing in Madrid, the results obtained using a prototype version of a photometric-stereo photographic system (used in tandem with the Lucida scanner) provided accurate information in the range of 25 microns.

In addition to providing new research material for scholars, the aim is also to explore how 3D data outputs can be made compatible with the IIF framework and available via Digital Bodleian, the Libraries' flagship platform for digitized image collections. This will open pathways for the delivery of new content informing the work of scholars at the University of Oxford and its constituent colleges, and other cultural heritage institutions. The ARCHiOX project will focus on three main areas. Supplying new higher-resolution recordings of the Gough map to assist in a Leverhulme funded research project, providing accurate surface recordings of palm leaf manuscripts with Sanskrit inscriptions and recording copper plate engravings and etchings. In each case the role of digital restoration and digital enhancement will assist in data presentation. Data storage and management will also form part of the initial twelve-month pilot project. Work is due to start in early 2022.

19-20.  
The digital data of one of the sculptures on the facade of San Giorgio Maggiore before and after merging LiDAR data and photogrammetry

#### WHAT NOW?

The debate about originality and authenticity was central to the conversations and discussions that followed the emotional reaction to the unveiling of the Veronese facsimile. It's a debate that has been gradually gathering momentum and has developed in interesting ways, but the reflections of Walter Benjamin, which were very much of their time and tend to circulate in over-simplified form, are proving hard to dislodge.

#### IN THE BLINK OF AN EYE — FACSIMILES COME OF AGE

In 2006 the Factum team began work on the Veronese painting that was installed in the Palladian refectory on San Giorgio Maggiore the following year. Now, 15 years later, Factum is opening a permanent installation in the Spanish Galleries at Bishop Auckland where all the objects of focus (walls, floors, ceilings, sculptures, paintings, photographs, and maps), are facsimiles or digital re-creations.<sup>28</sup> At the same time, in an ironic reversal of a more ordinary conventional exhibition, all the pieces of furniture

used by the visitors for reading, writing, or sitting on, are seventeenth century originals. Curating this display has involved the nurturing of new types of relationships between Spanish and English organizations in which all parties benefit.

In the *Blink of an Eye* has been conceived as a portal into the Spanish mindset as it was assembling the most powerful empire of its time. Digital technologies have enabled great works of art to migrate to the north-east of England, creating a parallel, physical world. The selection of beautiful, diverse, complex, multifaceted objects made on the Iberian Peninsula by Islamic, Jewish, and Christian artist-craftspeople between the discovery of America in 1492 and The Great Plague of Seville (1647–52) that devastated the city, offers a vision of a world very different from our own. As you enter this mirror-world, issues of originality and authenticity, market and aesthetic value, museum display and classification dissolve. In a traditional museum, both the concept and construct can make you feel like an outsider looking in. Here you are an insider, inhabiting the same world as the objects. This new type of immersive sensory experience was commissioned by Jonathan Ruffer to put the display of original paintings in the Spanish Gallery into context, and to celebrate new forms of sharing and preserving, made possible by digital technology. Most of the objects from which the facsimiles have been made are still owned by the families or institutions who commissioned them. Many can be visited and experienced in Seville and Toledo today, in the places for which they were made.

When Pasquale Gagliardi commissioned the facsimile of the *Wedding at Cana* there were many dissenting voices in the academic and conservation communities who saw a facsimile as a mere “fake”, with all the negative connotations of a forgery or scam whose purpose is to cheat. Gradually the same communities are starting to see the potential of this approach to both help with preservation and lead to new and deeper insights. It is a process of verification rather than falsification in which digital technologies can lead to new forms of scholarship and new insights supported by hard and detailed evidence. The facsimile in the refectory has amplified the voice of the original in the Louvre.

#### WHAT NEXT?

Over the past 20 years the management of the island of San Giorgio ensured that the physical spaces were preserved, adapted, and reused to create an environment in which the conditions for enriching forms of human interaction can take place. In the heart of Venice, the island of San Giorgio Maggiore is increasingly being recognized as a location that prioritizes a deep and creative engagement with culture. The fact that in 2021 it is essentially devoid of commercial exploitation is something rare and completely extraordinary. Human communication, understanding, empathy, and access to knowledge shape the character of the island.

In the heavily monetized world that has been constructed over recent years, technology often plays an impoverishing role in which text messages are the new norm. Social media has placed great value on branding and celebrity and many cultural organizations are looking to Non-Fungible Tokens (NFTs) to provide new money-raising opportunities. The development of blockchain, the digital ledger of transactions, has resulted in the emergence of cryptocurrencies and a growing interest in NFTs. A new form of value is being discovered that is not based on materiality but on the evidence of an original purchase that can then be tracked and traced. In an art market that has been based on scarcity and fixed notions of originality, the NFT presents new challenges that will require a radical rethinking about where value really lies. With NFTs, it is the “disembodied” authenticity that has value. It will be interesting to see where NFTs lead. Perhaps



[21.]



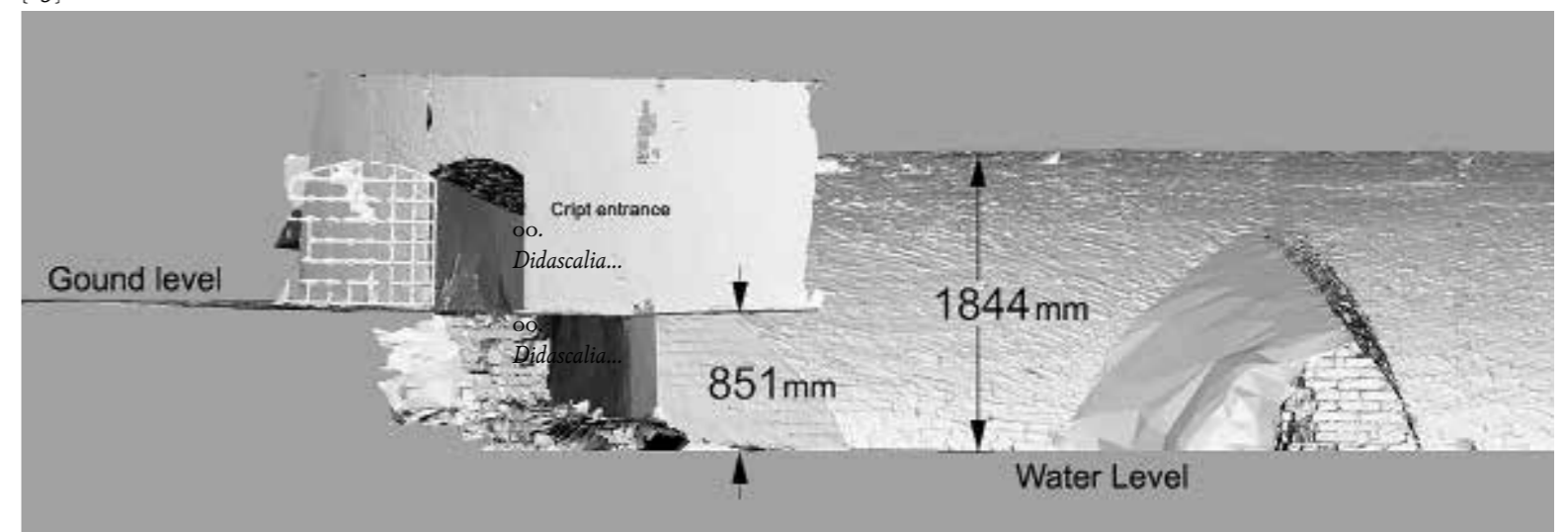
[22.]

21. Detail of the plaque on the facade of San Giorgio Maggiore

22. 3D model of the altar of San Giorgio Maggiore



[23.]



[24.]

23. LiDAR data of the inside of San Giorgio Maggiore

24. Visualization of the flooded crypt of San Giorgio Maggiore





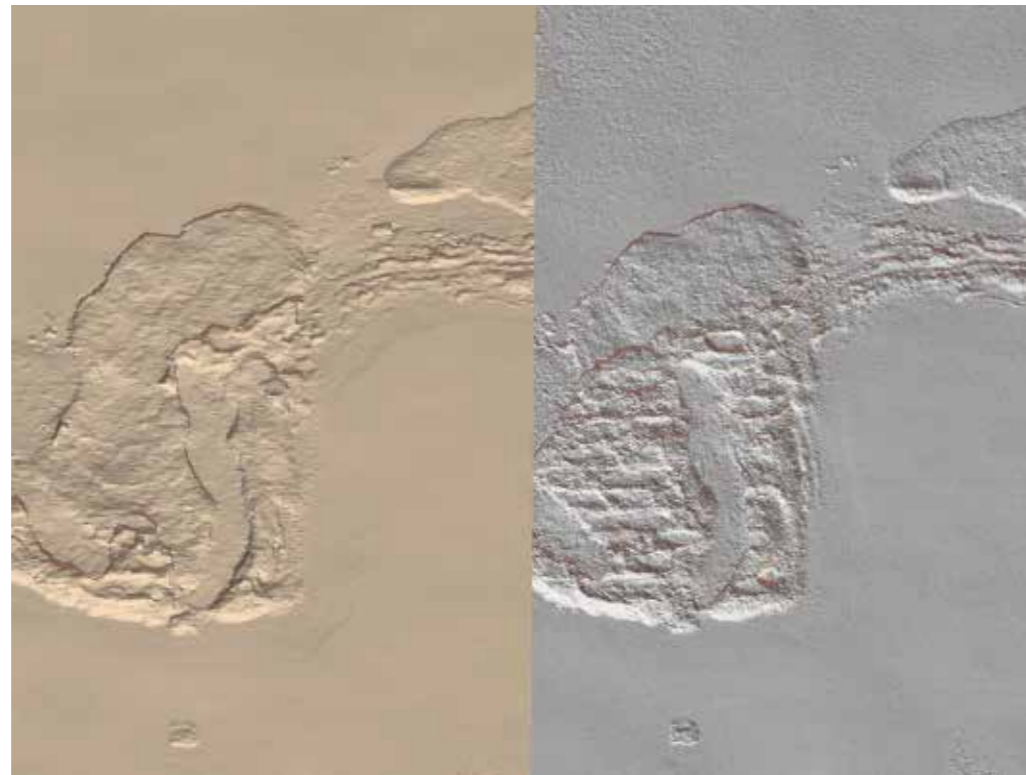
[25]

25.  
Point cloud of the flooded crypt of San Giorgio Maggiore

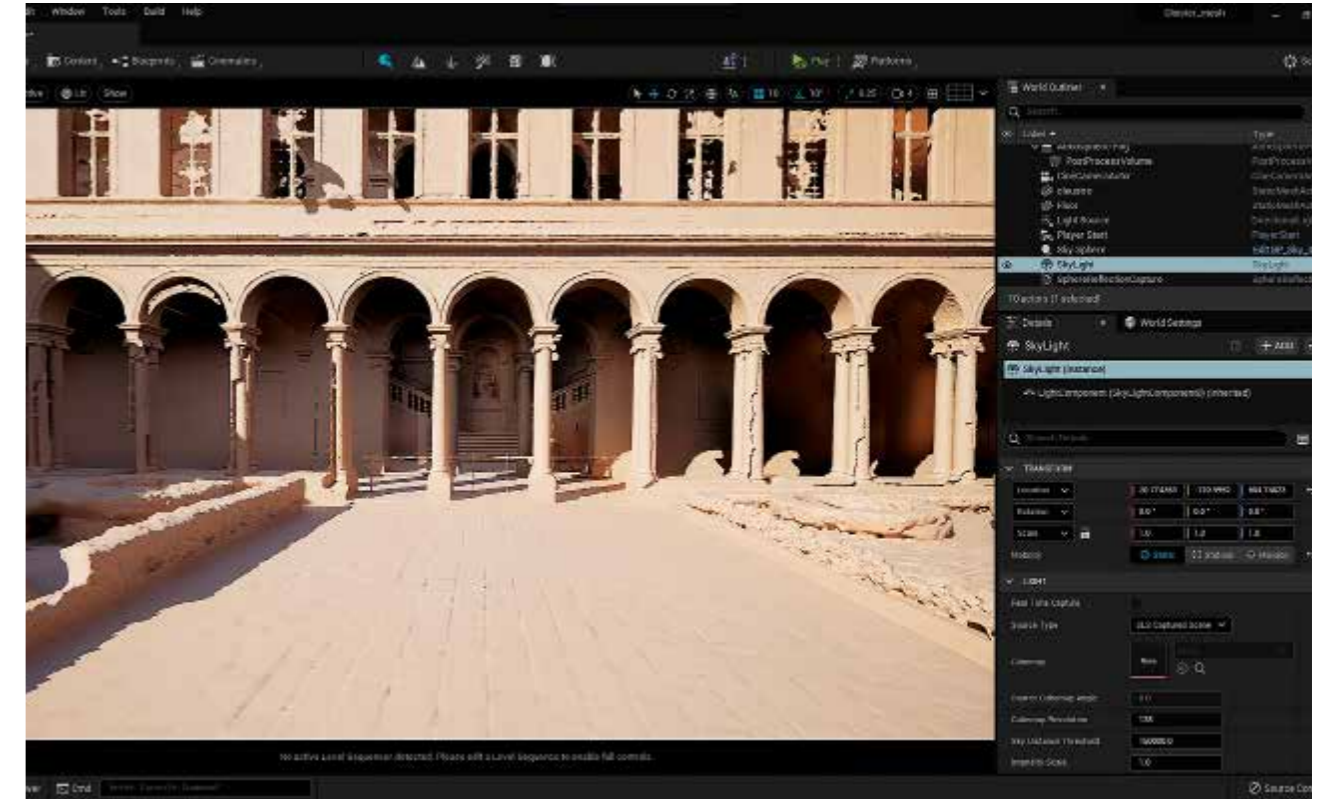
26.  
The difference between the two sets of data (2020 and 2021) on the same wall section inside one of the cloisters shows the ongoing salt damage on the plaster surface

27.  
Visualization of the entrance to the Longhena Staircase using Unreal Engine

28.  
The LiDAR data of the Longhena Staircase



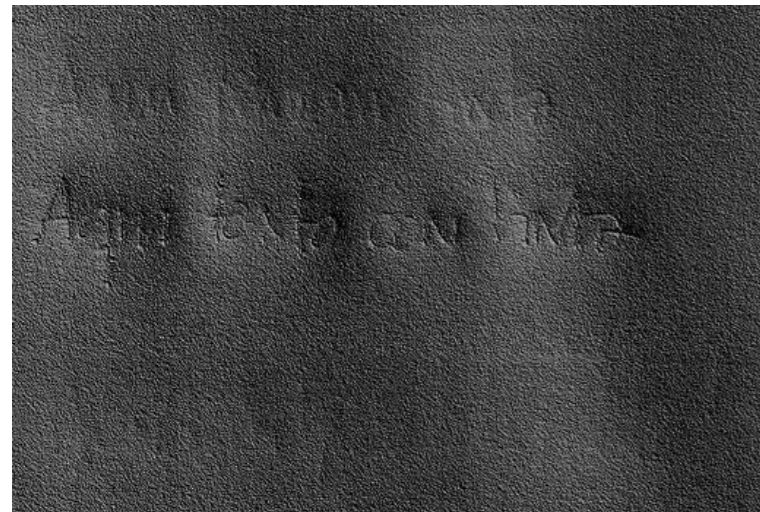
[26]



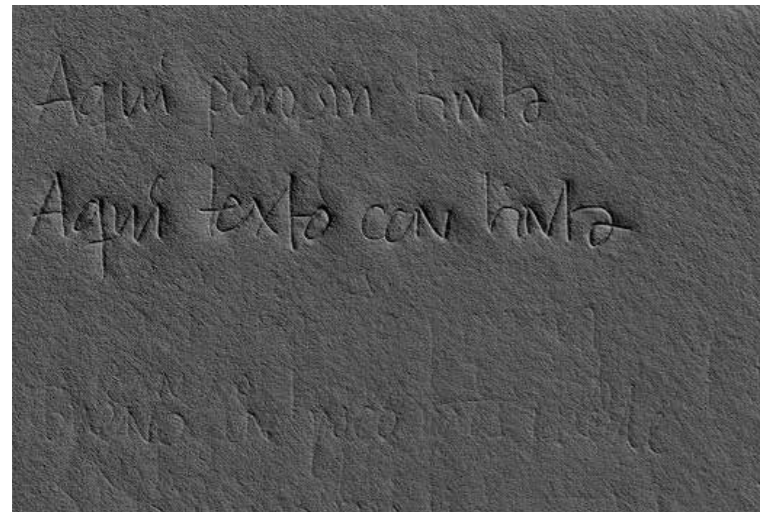
[27]



[28]



[29]



[30]



[31]

they will provide a new source of funding and new opportunities, or perhaps the exponentially increasing energy costs to sustain the system will lead to its rapid collapse. Factum has spent the past 20 years dematerializing and rematerializing works of art and untangling the relationship between the original and the authentic. As things move backwards and forwards between physical and digital spaces with increasing faithfulness, a new “digital connoisseurship” has emerged. Medical imaging is reshaping our understanding of health and its treatment. In a similar way, imaging, output technologies, and analytic software are extending access to the role culture plays in communication and sharing knowledge and experience. The Fondazione Giorgio Cini continues to demonstrate the importance of cultural communication (in many forms) and dialogue.

The diverse forms of data being recorded within ARCHiVe provides access to the thought processes and decisions made by people who have lived at different times, with different social structures, different gods, philosophical frameworks, value systems, and ideas about the way materials and sounds combine to become articulate. When concepts are divorced from physical evidence they tend to dissipate. Thoughts and ideas need to find their form. They are always rooted in their time but accessible to those who take the time to look, listen, and question.

#### CONCLUSION

For many years there has been a sense that the island of San Giorgio Maggiore is like the enchanted island in Shakespeare’s *The Tempest*. What happened after Prospero left the island and returned to Milan? The play ends with a sense of resolution. There are hints that the next generation may repeat the faults of the past as Miranda and Ferdinand play chess, a game focused on regicide, in which Ferdinand appears to sacrifice his king to win her love. Miranda’s innocence seems at odds with Ferdinand’s inevitable assumption of the throne in the world outside the game (the lower left-hand corner of Veronese’s *Wedding at Cana* seems to echo the complexity of all engagements and marriages). But there is also hope that the island of magical potential will find a new role in the ecology of preservation where humanity and its environment fundamentally renegotiate their relationship. Nature and culture need a new ecology of preservation in which *techné* (the context-dependent act of making and doing) dissolves the professional divisions that separate Art, Science, and Technology.

The philosopher Adrian Cussins coined the term “environ-mental” as the type of embodied space that human thought both negotiates with and is dependent upon. It seems to capture the ambitions of the Fondazione Giorgio Cini under Pasquale Gagliardi’s stewardship. It also promises a very positive future that will help to raise the right questions and continue the spirit of learning, knowledge, and preserving the past that have been alive on the island since the formation of the Benedictine monastery in 982 CE. While there is a growing interest in applying digital technologies to the preservation of cultural heritage, it is often dismissed as an expensive luxury. The preservation of the environment is increasingly critical and it is not a luxury. Venice is on the frontline and the changes between the islands (often artificial) and the water that have real human and financial consequences.

The Fondazione Cini demonstrates that culture is primarily about building empathy and communicating the richness and diversity of knowledge. In Venice, more than anywhere else, tourism is a fact of modern life. But, unless sharing, access, and long-term preservation are prioritized, the future looks ominous. Attracting new audiences and injecting a sense of urgency is the challenge for the years ahead. The old dualities – an-

29  
Handwriting sample recorded with the Lucida 3D Scanner: lower incised lines not readable

30  
Handwriting sample recorded with Factum’s Photometric scanner: lower incised readable

31  
Otto Lowe recording the Longhena Library

alogue/digital, authentic/fake, virtual/physical, original/copy, art/science – are giving way in the face of the biggest challenge of all: not just the preservation of the evidence of human creativity, but the preservation of the conditions that made human life possible in the first place.

The recording of the whole island and its contents is a shared vision that is now possible. The work has started on San Giorgio. It is possible to extend this to the entire lagoon. There is a lot of work that still needs to be done. It is within our power to do so. We have barely started.

....what's past is prologue, what to come in yours and my discharge.  
[William Shakespeare, *The Tempest*]

[32.]



32.  
The Divirod sensor overlooking the area in front of the Fondazione Giorgio Cini

- 1 *Coping with the Past. Creative Perspectives on Conservation and Restoration*, edited by P. Gagliardi, B. Latour, and P. Memelsdorff, Firenze, Olschki, 2010. The text is included in this publication.
- 2 *The Miracle of Cana. The Originality of the Re-Production*, edited by P. Gagliardi, Verona, Cierre Edizioni, 2011.
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- 4 *Passepartout* was a weekly television programme conceived by Philippe Daverio and Mauro Raponi. Each episode explored a specific theme through various and bold associations of ideas spanning from cultural heritage, history, recent news, and exhibitions. The non-academic tone made the programme very popular in its 10 years of broadcasting on Rai 3 (2001–11). <https://www.youtube.com/watch?v=kbMqWXnpXcA>
- 5 <https://www.vam.ac.uk/articles/explore-the-raphael-cartoons#slideshow=3891&slide=0> <https://www.factumfoundation.org/pag/1560/the-high-resolution-recording-of-the-raphael-cartoons>.
- 6 <https://www.factum-arte.com/pag/1734/>.
- 7 <https://www.factum-arte.com/pag/154/the-arts-of-piranesi-architect-engraver-antiquarian-vedutista-designer-the-exhibition>; G. Pavanello, *Le Arti di Piranesi. Architetto, incisore, antiquario, vedutista, designer*, Venezia, Marsilio, 2010.
- 8 *Piranesi Roma Basilico. L'arte di vedere*, a cura di L.M. Barbero, Roma, Contrasto, 2019.
- 9 <https://www.factum-arte.com/pag/604/virtual-tour-of-piranesis-prisons>; After Venice the exhibition toured, Madrid, Barcelona, San Diego – the video keeps being regularly included in exhibitions (currently at the National Gallery of Copenhagen, Denmark).
- 10 [https://elpais.com/elpais/2012/05/04/opinion/1336130997\\_149447.html](https://elpais.com/elpais/2012/05/04/opinion/1336130997_149447.html).
- 11 <https://www.factum-arte.com/pag/283/penelopes-labour-weaving-words-and-images>; *Penelope's Labour – Weaving Words and Images*, edited by A. Lowe and J. Brotton, Madrid, Factum Arte, 2011.
- 12 <https://www.factumfoundation.org/pag/797/mindful-hands-masterpieces-of-illumination-from-the-fondazione-giorgio-cini>.
- 13 <https://vimeo.com/251776755>.
- 14 <https://www.factumfoundation.org/pag/1598/the-materiality-of-the-aura-new-technologies-for-preservation>.
- 15 [http://www.highres.factum-arte.org/Polittico\\_Griffoni\\_html/index.html](http://www.highres.factum-arte.org/Polittico_Griffoni_html/index.html).
- 16 *The Aura in the Age of Digital Materiality. Rethinking preservation in the shadow of an uncertain future*, cit.; [https://www.factum-arte.com/resources/files/ff/publications\\_PDF/the\\_aura\\_in\\_the\\_age\\_of\\_digital\\_materiality\\_factum\\_foundation\\_2020\\_web.pdf](https://www.factum-arte.com/resources/files/ff/publications_PDF/the_aura_in_the_age_of_digital_materiality_factum_foundation_2020_web.pdf).
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- 19 <https://www.phf.org.uk/our-work-in-the-uk/helen-hamlyn-trust/>.
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- 22 <https://www.factumfoundation.org/pag/1640/recording-the-island-of-san-giorgio-maggiore>.
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