Technology in the arts, humanities and cultural heritage

Franz Fischnaller

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ANNO XXIX N. 101-102 / GENNAIO-GIUGNO 2016 / 34 €

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Sommario

Immagine in copertina e qui a fianco:
3D Gilded Digital Model of the *Diadoumenos* - Delos, Greece, marble Hellenistic copy after a famous original bronze by Polykleitos (5th century B.C.). This reconstruction is based on the study of its surface treatments by Brigitte Bourgeois (C2RMF) and Philippe Jockey (Ecole Française d'Athènes). *©Archeomed / Fabricia Fauquet*

Dossier

Éclat. Brilliance and its erasure in societies, past and present: vocabulary, operations, scenographies, meanings

edited by Philippe Jockey, Helen Glanville, Claudio Seccaroni

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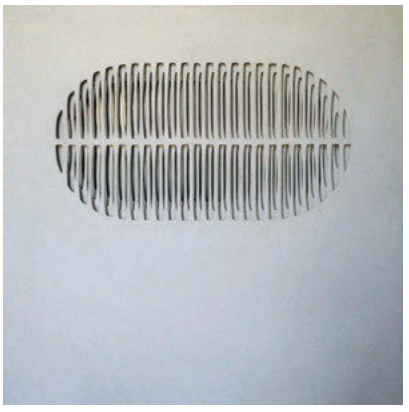

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Éclat

Brilliance and its erasure in societies, past and present: vocabulary, operations, scenographies, meanings

edited by Philippe Jockey, Helen Glanville, Claudio Seccaroni

translations by Francesca Glanville-Wallis and Helen Glanville (for Glanville Academic Editing)

Kermes presenta in questo numero doppio, insieme a un importante panorama di articoli, l'ampio dossier, quasi 100 pagine, dedicato all'*éclat*. Continuando la fortunata serie di numeri speciali con particolari approfondimenti tematici – serie che vedrà prossimamente l'uscita di "Around Andrea del Sarto" e "Applications of 3D Technology in Cultural Heritage" – *Kermes* si augura di rispondere positivamente alle esigenze di aggiornamento dei lettori e di contribuire con il proprio impegno editoriale a un costruttivo sviluppo del dialogo, interdisciplinare e internazionale. Per meglio favorire il dialogo appunto internazionale, data la diversa provenienza linguistica dei contributi raccolti nel dossier, si è scelto di pubblicare tutti i testi in inglese, lingua "franca" che permette una comunicazione più diffusa.

Éclat; è probabile che la parola susciti in primo un certo senso di estraneità: in effetti, nell'ambito dei temi dedicati alla cura del patrimonio culturale, il lessico italiano, come di altre aree linguistiche, usa con scarsa frequenza il termine *éclat*.

Ma se consideriamo più in generale gli aspetti quotidiani della nostra società, allora facilmente si individua la presenza del termine in paradigmi linguistici e concettuali comuni: dall'usatissima espressione "eclatante" alla marcata presenza di *éclat* nei nomi e descrizioni dei prodotti cosmetici. È proprio il ruolo di *éclat* come parola-chiave nel mondo della moda e in particolare della cosmesi che ci porta direttamente – come già richiama Philippe Jockey nell'Introduzione – a una delle prospettive di lettura. Una lettura che accompagna l'estensione della pertinenza dell'*éclat* – scultura, pittura, architettura, oggetti rituali... – con una coinvolgente e prolifica pluralità di approcci (semiologia, archeologia, informatica, antropologia, sociologia...).

Prima di lasciarvi immergere in questo sfaccettato dossier, con piacere vogliamo rivolgere un particolare ringraziamento ai curatori Philippe Jockey – ideatore di questo insolito e affascinante viaggio nell'*éclat* –, Claudio Seccaroni e Helen Glanville.

Andrea Galeazzi
Direttore editoriale

Si ringrazia il Laboratoire d'Archéologie Moléculaire et Structurale, CNRS-UMR 8820, Université Pierre et Marie Curie (UPMC-Sorbonne Universités) per avere fattivamente sostenuto "Polyre" e questa pubblicazione

Foreword

Philippe Jockey
University of Paris Nanterre. Team Archaeology of the Greek World and Information Systems / ArScAn - Archaeology and Sciences of Antiquity - UMR 7041 (CNRS - University of Paris Nanterre - University of Paris 1 Panthéon Sorbonne - Ministry of Culture)

We have chosen to bring together for publication in the international review that is *Kermes*, contributions from the two series of lectures which I organised in spring and autumn 2015 at the University of Paris-Sorbonne as part of my thematic chair "Polyre" (Sorbonne Universités): "L'éclat, le geste et la société" and "J'efface donc je suis,"[1] under the general title: *Brilliance and its erasure in societies, past and present: vocabulary, operations, scenographies, meanings*. The lectures have been expanded and amended for publication in print, and additional authors have been invited to contribute.

We owe this rapid coming to press to the efforts of Philippe Walter[2] and Charlotte Ribeyrol[3] (project coordinators of "Polyre" programme) and to the decisive contribution of the two editors of the special number of *Kermes* devoted to the painting technique of Nicolas Poussin which appeared in autumn 2014[4] (Helen Glanville[5] and Claudio Seccaroni[6]), and furthermore to Andrea Galeazzi who enthusiastically welcomed the inclusion to his publication. Our thanks also go to Véronique Atger, Research Coordinator at Sorbonne Universités, for all the interest she has shown in this subject, and for her public expression of this interest, and indeed her support, throughout 2015.

The choice of *Kermes* rapidly imposed itself because of its international readership and wide circulation, reaching beyond the restricted circle of our respective specialist publications, already the presiding philosophy throughout the series of lectures.

NOTES

1. *Brilliance, the operations and the social context and I erase, therefore I am.* The programme of the series of lectures, not all of which are here included, is available online at Laboratoire d'Archéologie Moléculaire et Structurale: http://www.umr-lams.fr/spip.php?article177.

2. Directeur du Laboratoire d'Archéologie Moléculaire et Structurale (UPMC-Sorbonne Universités, CNRS-UMR 8220, Laboratoire d'Archéologie Moléculaire et Structurale - LAMS).

3. Université Paris-Sorbonne, Vale (Voix Anglophones, Littérature et Esthétique (EA 4085).

4. H. Glanville, C. Seccaroni (eds), *Nicolas Poussin. Technique, Practice, Conservation*, "Kermes", 94-95.

5. Laboratoire d'Archéologie Moléculaire et Structurale, UPMC- Sorbonne Universités, CNRS-UMR 8220.

6. ENEA, Italian national agency for new technologies, energy and sustainable economic development, Italy.

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INTRODUCTION

L'éclat: the scientific challenges of an extinguished brilliance

Philippe Jockey

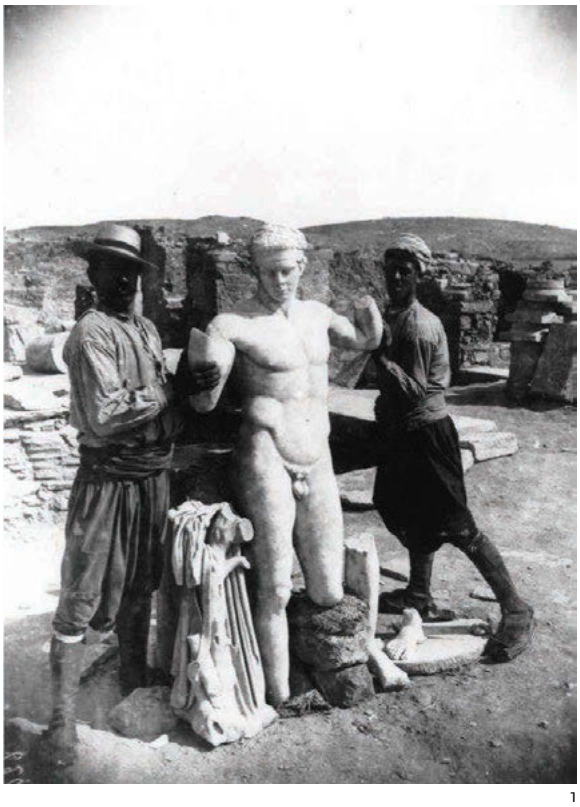

Fig. 1. The deceiving brilliance of the whiteness of Greek sculpture and its modern setting: the discovery of the *Diadumenos* in Delos in 1894. The examination of the surface of this Hellenistic marble copy of a famous work by Polykleitos of Argos (5th century B.C.), showed that originally it had been entirely covered in gold leaf.

1

That the monuments and the sculptures of Antiquity were indeed gilded and coloured, is a fact that today no longer astonishes. The material nature of the pigments, colorants and metal alloys in which this chromaticity consisted, have benefited from the dazzling progress of science over the past few years,[1] and their use is now increasingly understood.

To this extent, one is no longer in any doubt (if one removes bad faith from the equation) either of the existence of this material chromaticity, nor of the central role this played in the societies that had placed colour at the heart of their sacred, public and private discourse, over thousands of years. One thinks first of all of the Greece of Antiquity, victim over the centuries of the ostensible immaculate purity of its temples and statues (fig. 1).[2]

A fundamental question remains today as yet unanswered: that of the original degree of lustre and brilliance of their surfaces. A brilliance of finish resulting from the use of organic materials (waxes or varnishes of plant or animal origin for example) that were applied according to recipes and with operations that are little known today, erased by their very fugacity. Evanescent, unless regularly maintained by "small hands" employed to this end, the physico-chemical characterisation of this finish has until now discouraged even the most determined. Nevertheless, who knows, perhaps in a few years...

However, the vocabulary for radiance, brilliance, shine, gleaming effect, gloss, brightness, refulgence etc. – all variants of the term *éclat* –, already indicates the core position this holds within a number of societies. In Antiquity, as we shall see, without *éclat* – without brilliance or sheen, colours or gilding were not valued in themselves. The production of a reflectant surface was before all else a sacred affair. Magistrates, as in Delos in the 3rd and 2nd centuries B.C., were responsible for providing for its splendour[3] out of their own pocket. The continuance of the good relations between a city or a sanctuary and its deities came at this price. A contemporary reading of these expressions, will examine its scope and fields of application in our own times.

Over and above the lexical research, the challenge for this publication is also to retrace the conditions and the modes of production of this brilliance in its multiple facets. To this end, we have convened other disciplines, and other periods. Given the absence of recipes transmitted through the written word, and of descriptions of the operations and their implementation, the contribution of experimentation here proves to be essential. The 'know how' linked to the imparting of brilliance, the knowledge of these operations and the ability to reproduce them, remains a challenge to both the scholar in his research and the artist. Here, the approaches which are now part of the tradition of the archeology of technical gestures and practices (of the *geste*),[4] are opened up to the unexplored mastery of the operations which create brilliance. Tribology, a discipline familiar to pre-historians, and more recently to proto-historians, is in its infancy in terms of its applications to the artistic productions of past societies.

Under what conditions, in what context, and to what end did brilliance radiate in the past, and is still ablaze

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today? It contributed to what can only be described as scenographic displays – true *mises en scènes*, whether these were of a sacred, political or private order (a term particularly appropriate here), and as expressions respectively of power and luxury (or its imitation). Is not brilliance, glitter or radiance the prime condition for the success of the counterfeit, of the seeming – the *paraître* – of cosmetics? Indeed, if the use of cosmetics is to be understood as a (re) ordering of the self in line with the order of the cosmos,[5] is this possible without radiance? It is easy to understand why the world of fashion and *haute couture* has already for some time risen to the challenge of mastering *éclat*. Today, we are beginning to have at our disposal new tools of virtual immersion that will propose to each and all the ultimate test of *éclat*, of its inner radiance: we are approaching here a synaesthetic kind of engagement of the self, the effects of which we have yet to measure with accuracy.

But are we really able to discuss brilliance without its erasure, whether wilful or accidental? This exploration, across both series of lectures, from one semester to the next, has highlighted the various strategies adopted by past and present societies to achieve or to preserve the skill and control of brilliance (and that includes erasure and substitution) in its several different forms of expression: technical, scenographic and ideological.

It is on the basis of these observations that we propose to the reader of *Kermes* the following route organised around three principal themes: a lexical enquiry, of course, opening up subsequently onto the operations and the techniques linked to brilliance, its creation, its preservation or on the contrary its erasure – a development particularly appropriate, we feel, to a publication dedicated to reflections of this kind! And finally, it is to the scenographic settings of this brilliance – this *éclat*, and of its erasure, that are consecrated the final episodes of our (continuing) enquiry. Inscribed over time and in a dialectical movement, they find in these latter days radical and bloody expression, on which I hope they may throw some 'light', a sombre brilliance...

NOTES

1. For an overview of the very latest techniques see Alfeld *et al* 2016.

2. Jockey 2015.

3. Cf. *infra*, pp. 11-16.

4. Archambault De Beaune 2000.

5. This is the meaning of the word for the action of *cosmèsis*, based on the verb *cosmeô* (Chantraine 1983, *s.v.*).

BIBLIOGRAPHY

Alfeld M., Mulliez M., Martinez Ph., Cain K., Jockey Ph., Walter Ph., *The Eyes of the Medusa. XRF imaging reveals unknown traces of antique polychromy*, "Analytical Chemistry of the American Chemical Society", 89 (3), 2016: 1493-1500.

Archambault De Beaune S., *Pour une archéologie du geste*, Paris, CNRS Éditions, 2000.

Chantraine P., *Dictionnaire étymologique de la langue grecque*, Paris, Klincksieck, 1983.

Jockey Ph., *Le mythe de la Grèce blanche. Histoire d'un rêve occidental*, Paris, Belin, 2015.

ABSTRACT

L'*ÉCLAT*: LE SFIDE SCIENTIFICHE DI UNO SPLENDORE ESTINTO

Nonostante la nostra conoscenza della policromia della statuaria e dell'architettura antica aumenti costantemente ogni giorno, l'effettiva evidenza del loro splendore (*éclat*) non è stata ancora compresa appieno. Eppure è proprio questa qualità, piuttosto che l'effettivo colore originario – ora privo della sua fragile apparenza – che potrebbe aver giocato un ruolo chiave nel mantenere l'ordine sacro e la politica sociale delle società antiche, ma oggi non ne resta che il nome. La scommessa effettuata in questa sede è stata quella di rivolgere l'attenzione a diversi periodi, diverse discipline e diversi strumenti, da un protocollo sperimentale fino a un'immersione virtuale, per consentire di cominciare a formulare delle risposte agli interrogativi connessi alla produzione, all'esibizione e al mantenimento dell'*éclat* e a chiarire i motivi che nel corso del tempo hanno portato alla sua eliminazione o perdita, deliberata o accidentale.

L'*ÉCLAT*: THE SCIENTIFIC CHALLENGES OF AN EXTINGUISHED BRILLIANCE

If our understanding of the polychromy of the statuary and architecture of Antiquity deepens with every passing day, the material evidence of their original *éclat* remains, on the contrary, slight. And yet it is this quality, rather than colour on its own – now bereft of its fragile nature – that may have played the key-role in the upholding of the sacred, political and social order of the societies of Antiquity. Erased today, except in name, we are here placing a wager: that it is by turning our attention to other periods, other disciplines and towards other tools that go from an experimental protocol to immersion in a 'virtual' re-creation, that we will be able to begin to answer some of the questions linked to its production, maintenance and staging, and to shed light on the reasons behind its erasure – accidental and deliberate – over time.

KEYWORDS

architecture, gilding, Antiquity, polychromy, cosmesis, éclat, erasure, sacred space, scenography, sculpture, Ancient Greece, brilliance, radiance

THE AUTHOR

Philippe Jockey

Professor of Greek Archaeology at the University of Paris Nanterre. His field of research leads him to investigate the nature, usage and value of colours used in the sculptures and architecture of Ancient Greece, as well as in their reception in later periods.

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ANCIENT, MODERN AND CONTEMPORARY STAGINGS OF *ÉCLAT* AND ITS ERASURE

Technology in the arts, humanities and cultural heritage

Franz Fischnaller

Fig. 1. Avatars: David, Renaissance-Age avatars. Project CityCluster - "From the Renaissance to the Megabyte Networking Age" - A Virtual Reality & High Speed Networking Project.

1

Fostering interdisciplinary research and innovation through cross-disciplinary interactions

There is remarkable potential for collaborative research and valuable pathways that can be followed between technology (for instance cutting-edge technologies and high-end media tools), design, culture, the humanities and the arts. Often, scientific, technological research and innovation, contribute to social and cultural advancement and transformation. Scientists, engineers, computer scientists, and developers can provide a useful infrastructure, framework, knowledge, tools and resources not generally encompassed by the arts and the humanities, which can contribute to these changes. From this perspective, cross-disciplinary collaboration could play an essential role in the field of cultural heritage.

Innovation and advancement in science and technology

On the one hand, researching and exploring the potential that has emerged from technological principles and methods, systems and methods of computer-vision, algorithms, science and technology of imaging, combined with immersive Virtual Reality (VR), simulation and real-time interactive systems (RIS), has contributed to the development of museum best practices, providing openings for innovative approaches for the implementation of interactive experiences and digital storytelling, that revisit and interpret the heritage of the past, and that can engage, in more active ways, the new generation of museum visitors (fig. 1).

On the other hand, a major contribution of research and collaboration across disciplines (for instance: science, technology, history, the humanities, the arts, and the social

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sciences) can be found in the Cultural Heritage field, and in the simulation and representation of the art and heritage of the past, and with what, and how, it was created by past societies. For example, how polychromy was used in past societies, as determined by the materiality of colour and aesthetic representation. The re-creation of cultural heritage with digital methods also has an impact on how information is shared: an artefact that may be thousands of miles away can be viewed by anyone, anywhere, in an accurate digital form (fig. 2). This also allows objects and sites to remain in their original locations, whilst providing access to their digital representations.

Innovation and advancement in science and technology is enabling research in the field of polychromy that is particularly significant and enriching, not only at the level of specialised research, but also in terms of visualisation, representation and simulation of content and exhibits destined to less specialist audiences, that provide new ways of representing the art of the past for new generations and those of the future. Within this framework, and in relation to advanced visualisation and simulation, the market increasingly benefits the field through making available software and tools that are accessible and user friendly (fig. 3).

3D modelling and digital animation tools

Among others we can mention the software packages of Autodesks, for example Maya – a 3D modelling and animation tool that allows one to create visual effects of a very high quality. This software had initially been designed and developed for the film industry and is now being used for design, visual effects, games, film, animation, visualisation and simulation in major industries including Digital Heritage. It is a flexible software, highly customisable, and is easily adaptable by experts for all kinds of applications and for the development of animations, simulations and interactive Virtual Reality.

Mental Ray, the Autodesk Maya software, uses techniques such as a scanline rendering algorithm and binary space partitioning algorithms, to render ray-tracing effects (fig. 4). Mental ray supports physically correct simulation of general global illumination, and is capable of simulating combinations of diffuse, glossy, and specular reflection and transmission, that gives high quality visual effects and performance to recreate the past in contemporary space.

Mental Ray is being used extensively in the field of cultural heritage and advanced visualisation, useful for representing and visualising how classical and ancient societies created cultural heritage artefacts (fig. 5). This tool is particularly useful for visualisation, and therefore to visualise brightness/radiance/glow in ancient and classical art, sculpture, architecture and archaeology. Mental ray is founded on advanced ray tracing algorithms to achieve the most realistic results and best visual quality. It combines established traditional rendering approaches with latest lighting and shading techniques. This allows one to visualise anything from purely stylistic and illustrative images with fast approximate shading models to highly realistic and physically accurate global illumination simulations. All of these effects may be used together in the final image.

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Fig. 2. Specular enhancement:
(A) Original Photograph;
(B) Reconstruction from PTM;
(C) An image computed by extracting surface normals for each pixel and applying a specular lighting model per pixel;
(D) Highlights computed in (C) added to (B).
Light direction is the same for all four images. This artefact is a 4000 year old neo-Sumerian tablet.
Image © Hewlett-Packard Laboratories, Tom Malzbender, Dan Gelb, Hans Wolters.

There are other rendering software with interesting performances that can enrich the field of cultural heritage, such as V-Ray for 3ds Max, as well the open-source Blender, that has similar features and is widely known in the community of authors in digital cultural heritage.

New Generation Interaction and approaches in cultural heritage. Immersive interactive digital environments for cultural heritage and museum audiences

Emerging technologies, interactive media, virtual reality and the shifting media phenomenon, have been transforming the way in which we present stories, as well as the way in which we express and create virtual storytelling. Moreover, through the intersection of digital media and interactive tools combined with 3D digital images and synaesthetic immersion, the visualisation and the art of cultural narrative and storytelling receives a new "dress" with multi-layered innovative features. This provides a dynamic interactive relationship between

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Fig. 3. Reflectance Transformation Imaging (RTI): The Sennedjem Lintel from the Phoebe A. Hearst Museum of Anthropology at the University of California, Berkeley. RTI representation showing colour information (bottom portion) and "specular enhancement" mode showing surface shape and enhanced reflectance (top portion).
Image © Cultural Heritage Imaging 2010 and the Phoebe Hearst Museum.

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Fig. 4. Rendered images of a van Gogh style painting using Maya to simulate directional lighting from above and fill lighting from below with its matte, existing varnish and simulated picture varnish and rendered image of a painting with simulated raking light and specular enhancement (left to right). *© Brittany D. Cox and Roy S. Berns, Program of Color Science, Rochester Institute of Technology [Ref: Using Maya® to Create a Virtual Museum. Brittany D. Cox and Roy S. Berns; Studio for Scientific Imaging and Archiving of Cultural Heritage; Program of Color Science, Rochester Institute of Technology, New York/USA].*

authors, audiences and mediums, in ways that have not been achieved before. A driven story with strong and interesting narratives, combined with a cognitively rich environment, immersive multi-platform devices and interactive techniques, can provide a huge potential for cultural heritage narratives, offering museums engaging and edu-entertainment experiences for the contemporary audience.

The advancement of image-based techniques for digitising environments and artefacts, and the techniques for generating Photo-real computer graphics models of real-world historic places, monuments and artefacts, is favourable.

The potential benefits of these techniques for cultural heritage are significant: objects and places can be archived in digital forms less susceptible to decay and plunder; scholars can test and communicate theories of reconstruction without disturbing original artefacts; and the world's artistic and architectural heritage can be vividly and widely shared among all those with access to a computer. In all likelihood, it will be a long time before an exact computer representation of an artefact – a record, one might imagine, of the object's atomic structure – will be able to be non-destructively recorded, stored, and rendered.

The rapid advancement of technology has transformed modern society. In the field of museums, these advancements have had a significant influence on learning about and experiencing cultural objects, and the heritage associated with these objects. Museums throughout the world have adapted various digital media strategies in exhibition design, spatial and floor planning, educational outreach, and social media interaction to take advantage of this shifting paradigm. Consequently, integrating new media interpretation into exhibition planning has become standard practice for enhancing the museum experience.

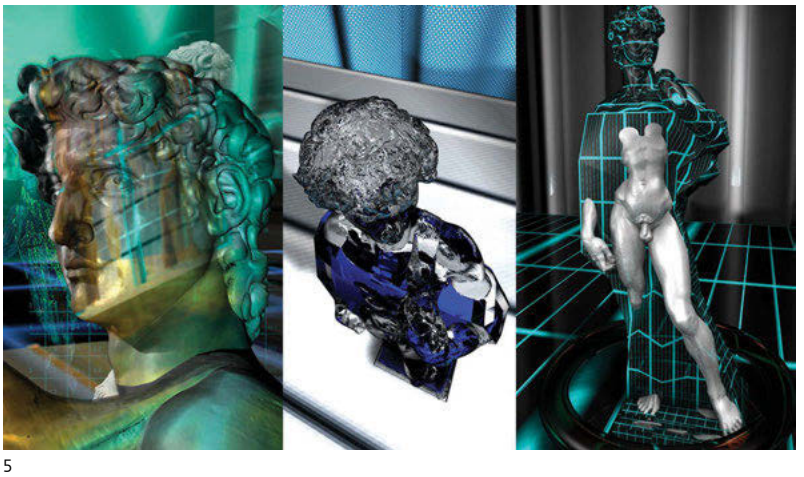

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Fig. 5. Mental Ray rendering in Maya: "David Avatar, CityCluster - Project" by Franz Fischnaller. *Image © Franz Fischnaller, 3D model provided by Stanford University.*

Individual Case Studies (I)

New generation interaction in cultural heritage immersive interactive exhibitions

The Last Supper Interactive Project (LSI)

Interactive storytelling and high definition immersive virtual narrative stereo application in Leonardo da Vinci's Art

Introduction

The Last Supper Interactive (LSI) project is a real-time-immersive interactive storytelling and virtual narrative stereo application in high-definition (3D-4K), based on the *Last Supper*, the late 15th century mural painting by Leonardo da Vinci, located in the refectory of the Convent of Santa Maria delle Grazie in Milan, Italy. LSI provides virtual storytelling techniques, interactive technology and user-driven interactive tools, that allow virtual access to the artwork - Leonardo's *Last Supper*. The LSI project can be considered an engaging immersive interactive application and virtual tool to explore how linear perspective was used by Leonardo da Vinci in his work.

Currently LSI application can run in an ultra-high resolution visualization system – 4K stereo display.

Driving force behind the LSI Project

The driving force behind this research was a desire to reflect, analyse and potentially envision cross-discipline matrix models and paradigmatic concepts, which combine and use methodologies from the traditional disciplines in the humanities, together with cutting-edge technologies and innovative tools, to empower the implementation of interactive immersive design solutions and tools for user interaction. The latter incorporate more engaging and creative learning methods for the active fruition of content and cultural heritage experiences, allowing users – among others – to gain a better comprehension of how traditional technology was mastered in order to achieve certain key techniques. Computer-vision algorithms, science and

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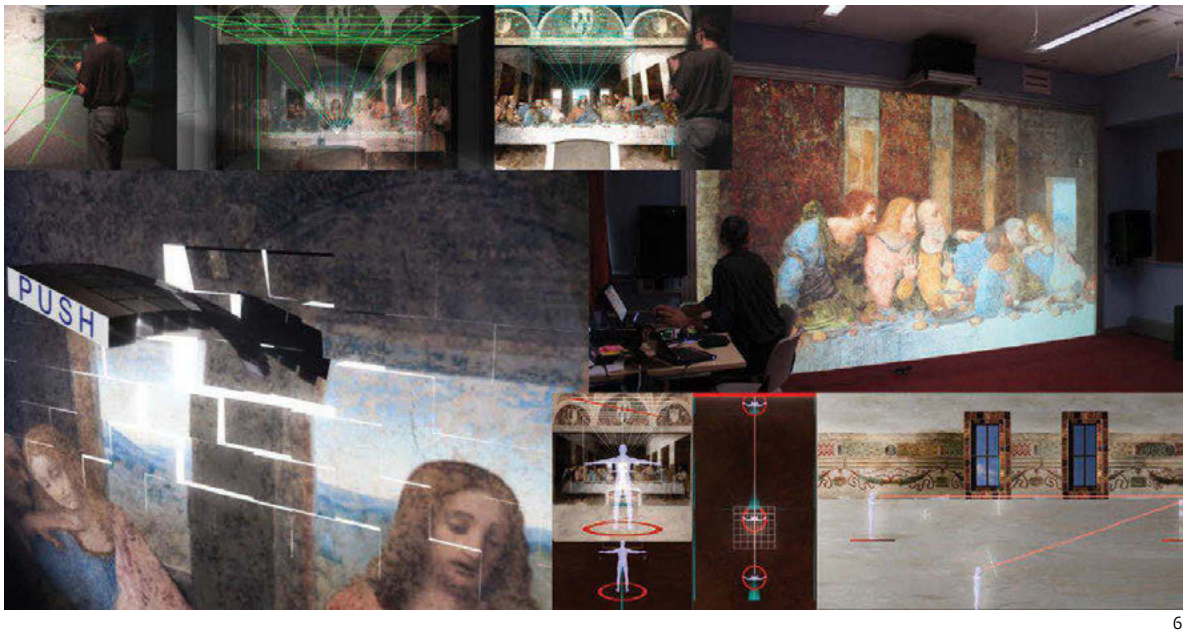

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Fig. 6. LSI project, a real-time virtual narrative and interactive storytelling application, with tools that provide a holistic, stereoscopic vision and multi-sensorial experience through higher sensorial immersion. Project by Franz Fischnaller. *Image © Franz Fischnaller.*

technology of imaging provide new perspectives into the artist's studio. David G. Stork, argues: "In the past, image processing of art has relied heavily upon the human eye and the judgment of art scholars and connoisseurs." Finally, computer graphics reconstructions of artists' studios allow scholars to explore "what if" scenarios, and thus better understand the working methods of certain artists. As such, conservators, curators and art historians, may find these computer methods to be valuable tools, once the strengths and limitations of these methods are fully understood.

Vision: technology in the arts, humanities and cultural heritage

This project, and its applied research work among other things, expects to provide useful results towards rethinking the use of immersive interactive technology in museums and cultural heritage centres; often viewed as the "conservators of the past" these become an "active" learning framework for the audience, and a flexible vehicle for bridging the past and the present in more engaging and compelling ways, fostering creativity, and transcending traditional boundaries to serve society in more innovative ways.

Interdisciplinarity based design methodology

The LSI project embraces an interdisciplinary based design methodology through a team, working across the fields of art, the humanities and social sciences with design and technology. The LSI expects to provide useful results towards rethinking immersive interactive technology in museums and cultural heritage centres, not only as heritage simulation and reconstruction communication of the past inside the museum.

Project description

The application is an immersive stereoscopic vision of, and an interactive journey through, Leonardo's *Last Supper*. It provides virtual storytelling techniques, interactive technology, digital tools, and virtual access to Leonardo's *Last Supper*, allowing visitors to become active spectators, and explore first-hand this Renaissance work of art in an immersive environment, and in close detail. In LSI, particular attention is given to location awareness, emotional involvement and cognitive processes in audio-visual perception. LSI provides an immersive stereoscopic vision and multi-sensorial experience, placing the visitors directly within the picture (fig. 6).

The LSI enables users to be virtually transferred in real time "inside" the painting; to inhabit, move and explore first hand from any perspective – a full 360° viewpoint – i.e. in and within the multi-perspective pictorial space of the three dimensional interactive environment of the painting's composition, instead of the external observation provided by a traditional two-dimensional view of the painting, with the possibility also of stepping in and out, both inside and outside the picture. The LSI allows visitors to gain a better comprehension of how traditional technology was mastered to achieve certain key techniques, specifically the use of the geometrical mathematics that underpin the linear perspective applied to two dimensional paintings from the Italian Renaissance, such as Leonardo da Vinci's masterpiece, the *Last Supper*, which used one point linear perspective (fig. 7).

Cultural heritage context

Background: Leon Battista Alberti – mathematical method for calculating linear perspective

Artists, in the early part of the Renaissance, struggled to master techniques to create an accurate illusion of three-dimensional space in their paintings. In 1435, Leon Battista Alberti (1404-1472), provided the first theory of what we now call linear perspective, the idea that converging lines meet at a single vanishing point, and that all shapes become smaller in all directions, with increasing distance from the eye. The impact of the use of this mathematical method in paintings was revolutionary, and as a result the art of painting was given a new direction, that is paintings were able to use linear perspective to

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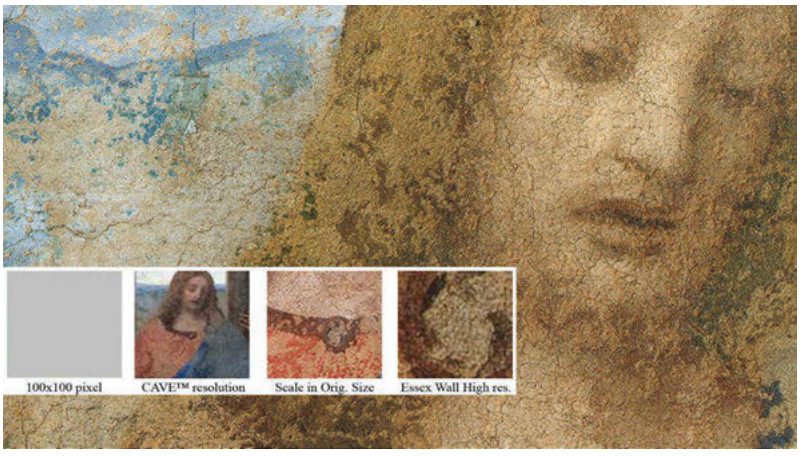

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Fig.7. Leonardo da Vinci, *Last Supper*, details of digital high resolution image: 58740 x 46339 pixel, 2.7 billion pixels. Resolution scale on 100 x 100 pixel. *Image © Haltadefinizione.*

create an illusion of three-dimensional space. This new technique marked the end of the Middle Ages, in terms of artistic technique, and pointed the way to the modern era. This change can be attributed to the work that Leon Battista Alberti published as a mathematical method for accurately calculating linear perspective. Artists learned the method, and became able to represent linear perspective in paintings. Leonardo, one of the most intriguing personalities in the history of Western art, was a pioneer of single point perspective in painting, which he used to create more realistic paintings with a stronger sense of naturalism. Leonardo's painting of the *Last Supper* has a single vanishing point. By making all of the lines in the painting converge at a single, invisible point on the horizon, a flat painting can appear to have depth.

Alberti's theorem virtual tool (ATVT)

The Last Supper Interactive can be considered to be an engaging immersive interactive application and virtual tool to explore how linear perspective was used by Leonardo Da Vinci in his work. An augmented virtual immersive interactive learning tool, called Alberti's theorem virtual tool (ATVT) was designed for the LSI project, serving as user-driven interactive virtual tool for the user. ATVT was inspired by Leon Battista Alberti's rules of linear perspective (*costruzione legittima*) and Brunelleschi's "viewer", using the first Baptistery panel based on the experimental diagram of Filippo Brunelleschi, represented by two panel paintings illustrating geometric optical linear perspective, in the early 15th century. The one-point linear perspective which revolutionised the arts and allowed for naturalistic styles initiated and then developed throughout the Renaissance. "His biographer, Antonio Manetti, described this famous experiment in which Brunelleschi painted two panels: the first being the Florentine Baptistery as viewed frontally from the western portal of the unfinished cathedral, the other one is the Palazzo Vecchio seen obliquely from its northwest corner" (https://en.wikipedia.org/wiki/Filippo_Brunelleschi).

The first Baptistery panel was constructed with a hole drilled through the central vanishing point. Curiously, Brunelleschi intended that it only be observed by the viewer facing the Baptistery, looking through the hole in the panel, from the unpainted reverse. As a mirror was moved into and out of view, the observer saw the striking similarity between the actual view of the Baptistery, and the reflected view of the painted Baptistery image. Brunelleschi wanted his new perspective "realism" to be tested not by comparing the painted image to the actual Baptistery, but to its reflection in a mirror according to the Euclidean laws of geometric optics.

ATVT allows visitors to explore first-hand the method of linear perspective in Leonardo's *Last Supper*. Users can experience in real-time, and in an immersive manner, the construction of linear perspective and how Leonardo applied the *costruzione legittima* to draw the lines of perspective. Users can overlay the virtual tool, demonstrating and experimenting the compositional perspective of Leonardo's masterpiece, and explore the relationship between the real architecture of the refectory, and the architecture painted by Leonardo.

LSI storytelling model: linear narrative

At the current stage of development, the LSI story is based on a linear storytelling model where the visitor experiences the story from a first person perspective, but can interact freely within it. A linear narrative is a method in which a sequence of events is narrated from the beginning to the end of a story, without variations or the possibility to alter for a user the way in which the story develops or ends. The storyline and interactions follows the user's interaction and decisions, yet the path of the story itself is linear. In addition to this model, there is a second option to be "teleported" directly to each of the scenes which are part of the VR application.

LSI scenes

Paths and Virtual Scenes. The application is articulated through six main scenes linked through two further scenes, for entry and exit.

LSI Virtual Scenes. LSI provides a number of alternative virtualized views and interactive navigations of the painting. The application is articulated through six main scenes linked through two further scenes for entry and exit such us: (1) Interactive Square (Point of departure/arrival); (2) Church of Santa Maria delle Grazie; (3) Refectory of Santa Maria delle Grazie; (4) Leonardo's *Last Supper* (wall-painting); (5) Immersion Inside the *Last Supper*; (6) Centre Point / Interactive Viewpoints (see below for further description); Stepping out of the Painting and Exit.

Centre Point / Interactive Viewpoints. Scene 6 allows a number of viewpoints in relation to the centre of projection and tracking to the vanishing point as described below: *Viewpoint A*: 6 m distance and 4.6 m below the centre point. Floor Level (Front view); *Viewpoint B*: 6 m distance and 0 m below the Centre Point (aligned straight, to the vanishing point) Above floor Level / 4.6 m; (Front view); *Viewpoint C*: 0.5 m distance and 0 m below the horizon line Above floor Level / 4.6 m; (Front view); *Viewpoint D*: 0 m distance and 0 m aligned straight, to the

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Centre Point, above floor Level / 4.6 m, Immersive View); (Front view); *Viewpoint E*: Inside the Centre Point, above floor Level / 4.6 m; (Immersive View); *Viewpoint F*: Centre Point Back view (Immersive view); *Viewpoint G*: Back side of the painting, aligned with Christ's viewpoint, above floor Level / 4.6 m.

Visitor interactive experience in LSI

Exploring "in and out" of the painting

Through the LSI, the visitor can inhabit the digitally reconstructed space of the painting in a 3D model. LSI users can move through the virtual reality environment representing the painting, with the ability to step in and out of Leonardo's *Last Supper* in real time, and in an immersive manner with a 3-Dimensional composition of the painting from any perspective – a full 360° viewpoint.

The visitor can inhabit the digitally reconstructed space of the painting in a 3D model, allowing them to: explore the geometrical composition; navigate close to and around the apostles sitting and standing at the table; and, experience the perspective from Jesus Christ's viewpoint at the height of the centre of projection, located on the right side of Jesus' head. Visitors can also explore the "backstage" of the painting, allowing them to look out, from the painted architecture, into the real architecture of the refectory.

The LSI application allows the visitor not only to view the art work from a distance of 6 m, as is true for the refectory of the Dominican convent, but it also allows it to be observed from different viewpoints, to explore the details of the masterpiece, and to interact with Alberti's Theorem augmented virtual tool. The LSI visitor may also use the application to observe it from a very close viewpoint.

Exploring the linear perspective in the Last Supper *with Alberti's theorem virtual tool*

The LSI allows visitors to gain a better comprehension of how traditional technology was mastered to achieve certain key techniques, specifically, the use of the geometrical mathematics that underpin the linear perspective applied to Leonardo da Vinci's masterpiece – the *Last Supper*.

Through ATVT visitors can explore first-hand the method of liner perspective in Leonardo's *Last Supper*. Users can experience in real-time, and in an immersive manner, the construction of linear perspective and to show how Leonardo applied the *costruzione legittima* to draw the lines of perspective, overlaying the virtual and experimenting the compositional perspective of Leonardo masterpiece and to explore the relationship between the real architecture of the Refectory and the painted architecture by Leonardo.

Most recent accomplishment of the LSI

The most recent accomplishment of the LSI, was the research and first experiment related to a Kinesthetic sense of presence, and haptic interaction, in LSI stereoscopic immersive virtual environments. The motivation behind this research was to incorporate haptic technology into the LSI virtual environment, and to enable interactive, haptic, feedback though mobile and wearable interfaces. By providing tactile and force feedback, users will be able to experience the sense of touch and to interact with the elements within the virtual environments, for instance in "Alberti's theorem virtual tool," Christ's Cup, Christ and the Apostles, etc. and convey a kinesthetic sense of presence to the user. We think that the integration of the sense of touch with haptic feedback, added to previously audio-visual-only solutions, engaging the users' haptic sensory system, in addition to seeing (and/or hearing) will enrich and benefit the current application. The aim of this experiment was to deliver the first successful sample of haptic interaction within the virtual environments of the LSI application and to convey a kinesthetic sense of presence to the user. This experiment and implementation was accomplished with the collaboration of the G-Scop Laboratory Grenoble Industrial Engineering School (GI), France and supported in part through the EU-FP7 Visionair.

Conclusions

The expected outcome of this experiment was successfully accomplished. As for the next step, we are planning to continue working on research and experiments in order to fulfill the ultimate goal of phase 4, that is to deliver an immersive high-end visualization Virtual Reality application that provides a kinesthetic sense of presence and haptic interaction.

Acknowledgments

The development of part of the project has only been possible due to the support and collaboration of government agencies, museums, industries, laboratories, foundations and researchers. We would like to thank all of them, including Università degli Studi di Milano, Italy; The Medienmuseum Zkm|Zentrum für Kunst and Design, Germany; Robotics srl, Italy; Emmeci srl, Italy; Ars Electronica Futurelab Aec, Austria; The National Museum of Science and Technology, 'Leonardo da Vinci' Italy; Cives Foundation and Agency Ville Vesuviane, Italy; the Virtual Archaeological Museum, Italy; Electronic Visualization Lab UIC, USA; Mediartech, Italy; the Municipality of the Region of Tuscany, Italy; the University of Bristol, UK; University of Essex, UK; VISIONAIR.

Individual Case Studies (II)

New technologies and media languages inside museums

The Sarcophagus of the Spouses Installation

Intersection between archaeology, 3D video mapping, holographic techniques combined with immersive narrative environments and scenography

The Sarcophagus of the Spouses Installation (Sarcophagus Installation) is an audiovisual performance and exhibit combining 3D video mapping, holographic techniques,

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computer graphics, high definition visualization with reconstruction heritage and digital storytelling, embedded in an immersive narrative environment and scenography. The installation is based on the *Sarcophagus of the Spouses* (Italian: *Sarcofago degli Sposi*), a terracotta Etruscan masterpiece measuring 1.14 m in height and 1.9 m in length created around 520 B.C., depicting a married couple together in their last embrace, and now located in the National Etruscan Museum of Villa Giulia, Rome.

The Sarcophagus Installation

It is a mixed media installation, that combines a three-sided pyramid hologram and a 3D video mapping projection system (3D architectural video mapping), covering a total area of 360 m^2. This project is aimed at the design and development of an immersive solution for the fruition of Digital Heritage. The design incorporates, and intersects, virtual narrative and storytelling with tools that provide a higher sensorial immersion, rather than the external observation of the artefact.

The design solution combines a large three-sided pyramid and a 3D architectural video mapping system generated by 10 laser projectors installed side by side, each one generating 2000 x 8000 pixels for a total of over 15 million pixels in a 3D map that goes up to 12 metres in height to cover a total area of 360 m^2. This installation, was conceived *ad hoc* for the Sala della Cultura, the ballroom of Palazzo Pepoli of the Museum Genus Bononiae of Bologna, Italy, as an integral part of the "Etruscan journey towards the afterlife", a two-venue temporary exhibition that took place from 25 October 2014 to 19 April 2015, bringing together Villa Giulia National Etruscan Museum, Rome (where the *Sarcophagus of the Spouses* is located), and the History of Bologna Museum Genus Bononiae, Palazzo Pepoli in Bologna (where the Sarcophagus Installation was exhibited).

Methodologies – Aims

The project encompasses an interdisciplinary approach across disciplines such as art, archaeology, cultural heritage, the humanities and social sciences, combined with leading technologies and advanced digital tools, with the aim of empowering the implementation of an immersive installation which incorporates engaging and creative design solutions for the fruition of content and cultural heritage experiences.

Research Context – Motivation – Goal – Objectives

The rapid advancement of technology has transformed modern society. In the museum field, these advancements have had a significant influence on learning and experiencing cultural objects and the heritage associated with these objects. Museums throughout the world have adapted various digital media strategies in exhibition design, spatial and floor planning, educational outreach, and social media interaction to take advantage of this shifting paradigm (https://www.hastac.org/blogs/claire-ross/are-digital-technologies-creating-engaging-museum-visitor-experiences).

Using computational methods and tools, scholars, curators, developers and creative media designers are opening new paths of research and discovery, renewing the study of artefacts from the past, posing and answering new questions. David G. Stork, states: "We may be entering a new era in the evolution of the study of fine art, an era where computer-vision algorithms will build upon the science and technology of imaging to help answer old questions, open up new vistas, and expand our understanding of art." A major goal of this project is to develop a visual narrative and a virtual storytelling installation with digital learning environments, supported by advanced technology and tools that provide a holistic immersive vision and a multi-sensorial experience to the visitor. This installation incorporates engaging methods for the fruition of content and cultural heritage. This project pays special attention to audiences, stimulating their curiosity to go beyond the picture (cultural asset, artefact), and explore the story within, behind and around it, motivating users to learn and explore. Particular attention is given to location awareness, emotional involvement, and cognitive processes in audio-visual perception enabling a sense of presence, and bringing an emotional involvement that provides deeper ways of sensing and feeling the heritage artefact.

Experts on the subject, argue that the cultural and heritage sector practices grow progressively, dependent upon digital technologies for the development, production, display and dissemination of works of art, and intangible and tangible cultural heritage data. Museums are required to keep an on-going open and flexible approach of exploration, experimentation and challenge to connect with the audiences of the new generations, in order to engage them successfully in a multiplicity of ways (participatory, aware and involved, etc.).

This project expects to contribute by providing valid results in the use of immersive and creative technology in museums and cultural heritage centres, not only for heritage simulation and reconstruction of the past inside the museum, but as a creative learning framework for audiences, and a dynamic vehicle for bridging the past to the present, in more emotive and compelling ways.

As experts in the field state that a strategic approach to the utilization of ICT (Information and Communication Technologies) for research in the humanities and social sciences has proved to be a key factor in stimulating innovation in the service of scholarship, and its advancement in cultural heritage practice. Other motivations and objectives gravitating around this project are: to critically evaluate how technology and digital media can be effectively used to support museum practices; to foster critical thinking and awareness and reinforcing creativity beyond traditional disciplinary boundaries to enhance what is currently practiced, and to contribute to the bringing of new perspectives for efficient experimental and creative approaches and scenarios in museum practice. The *Sarcophagus of the Spouses*, an icon of the Museum of Villa Giulia, is a unique model in the

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world, with the exception of the sarcophagus located at the Louvre since the 19th century.

It is undeniable that the digitisation of art, artefacts, paintings etc. is generating changes in cultural, and heritage, museums and institutions. The continuing acceleration in the digitisation of information, combined with the increasing capacity of digital information storage, is causing the traditional model of museums (i.e. as static collections of three-dimensional specimens and artefacts) to expand to include virtual exhibits and high-resolution images of their collections for perusal, study, and exploration from anywhere through the Internet (http://nodem2013conference.sched.org/overview/type/rethinking+design+of+museums+and+exhibitions#.U2JRs_l_uSohttp://en.wikipedia.org/wiki/Museum).

The *Sarcophagus of the Spouses*

As Maria Anna De Lucia, Director the National Etruscan Museum in Rome states: "the *Sarcophagus of the Spouses* is particularly fragile. Its 400 pieces were put back together again, and for this reason the artefact cannot leave Villa Giulia. One of the motivations for developing the virtual heritage exhibit and the simulation of the *Sarcophagus of the Spouses*, was the impossibility of the artefact to be moved. As a consequence, this icon can travel around the world. Thanks to the scientific rigour of the digital acquisition, visitors can enjoy on the simulated artefact on a realistic basis" (fig. 8).

Digital acquisition of the Sarcophagus

47 GB of data was produced by an acquisition campaign realised by five teams of researchers pertaining to CNR-ITABC, CNR-ISTI, the Bruno Kessler Foundation, Bologna University and Leica using different technologies. The process was documented during a workshop.

The data was delivered to the Soprintendenza. The point clouds were treated with MeshLab and Blender, creating an *ad hoc* video rendering for the holographic display following the requirements of the installation designer, Franz Fischnaller. The data set, high-resolution and detailed photo-realistic, accurate 3D models and images of the sarcophagus derived from the digital acquisitions and 3D modelling based on different technologies (Photogrammetry, TOF and triangulation-based laser scanning), was conducted in 2013 by the project partners coordinated by the CINECA consortium. In order to enable researchers to work on a proper basis, the sarcophagus was removed from the protective glass showcase and taken to a larger room of the Villa Giulia Museum (fig. 9).

The artefact was divided into its four parts. The last time that this occurred was during a restoration in the 1950s. The digital restoration of the sarcophagus took into account the indications of Etruscologists. which was required in order to implement part of the content and the narrative, a conceptual approach based on the original artefact at the time of its discovery in the 19th century.

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Fig. 8. The Sarcophagus of the Spouses Installation. *Images © CINECA, MiBACT, Genus Bononiae and Franz Fischnaller.*

Digital acquisitions and 3D modelling of the Sarcophagus

In order to create the 3D architectural mapping, the first step was the geometrical modelling of the Sala della Cultura, realised by means of photogrammetry techniques with an elaboration in Photo Scan, then in Mesh Lab and, finally, in Blender. Researchers took more than 500 high-resolution pictures of the entire sarcophagus at an average distance of 1 metre with a resolution of about 0.3 mm on the object from around the sarcophagus, producing different kinds of information The data set, high-resolution and detailed photo-realistic, accurate 3D modelling models and images of the sarcophagus derived from the digital acquisitions and 3D modelling of the sarcophagus. Part of this digital data produced different kinds of information (including colours, old restorations, etc.) and, once processed, they were used for the 3D mapping and hologram content development and visualization of the Sarcophagus Installation.

High quality heritage content visualization

A significant aim behind this project was to provide a close view of the sarcophagus' elements, including new information and insights on this masterpiece, obtained as a result of the digital acquisition, 3D survey and 3D modelling.

In addition, a major goal of this project, successfully accomplished, was to present for the first time in a public exhibit, high quality images and visualisation (3D animation and video) of the sarcophagus, with the possibility of zooming-in on details that are not visible to the naked eye, to the Museum's visitors, where the original artifact is located (fig. 10).

Fig. 9. 3D mapping projection data. Digital acquisition of the sarcophagus. *Images © CINECA, MiBACT, Genus Bononiae and Franz Fischnaller.*

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Fig. 10. Museums with immersive and interactive exhibits. *Images © Parliament-for-Europe, Ars Electronica, Linz, Austria; EVL UIC, Chicago; dsl_panoptikum; Science Muceum, Openin g of Collider; yello gIpG1 16437. Berlin's Magma Architecture Head-In/im kopf at the Berlinische Galerie, Museum for Contemporary Art, Franz Fischnaller.*

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Museums with immersive and interactive exhibits

Among the Museums with immersive and interactive exhibits, we would like to mention amongst others.: Ars Electronic Center, Austria, FHW – Foundation of the Hellenic World, Greece, The MAV: Virtual Archaeological Museum of Herculaneum, European Parliament Visitors' Centre Brussels.

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Scholar, media artist, designer and transdisciplinary researcher. Recognised for the creation of his digital, virtual reality and interactive works and installations works across the fields of art, technology, humanities and cultural heritage. He teaches at the Accademia Albertina di Belle Arti di Torino, Italy.

ABSTRACT

LA TECNOLOGIA NELLE ARTI, NELLE SCIENZE UMANE E NEL PATRIMONIO CULTURALI

Le pratiche nel settore dei beni culturali si affidano sempre più alle tecnologie digitali per lo sviluppo, produzione, fruizione e disseminazione delle opere d'arte e del patrimonio culturale materiale e immateriale. È quindi indispensabile che coloro che ricercano e lavorano nel campo del patrimonio culturale comprendano la rilevanza delle implicazioni sociali, culturali, creative e innovative e che conoscano i principi base e i contesti che sostengono queste tecnologie per sfruttarli pienamente. L'esperienza ha dimostrato che tecnologia e media digitali, in combinazione con la consapevolezza olistica e con altre discipline possono essere utilizzati efficacemente per contribuire allo sviluppo delle migliori pratiche nei musei, con beneficio del settore. In questo contesto sono discussi come esempi due realizzazioni concernenti l'*Ultima cena* di Leonardo e l'etrusco *Sarcofago degli sposi*.

TECHNOLOGY IN THE ARTS, HUMANITIES AND CULTURAL HERITAGE

Practices in the cultural and heritage sector increasingly rely on digital technologies for the development, production, display and dissemination of works of art and both material and intangible data. It is indispensable, therefore, that those researching and working in the field of cultural heritage understand the relevance of the social, cultural, creative and innovative implications, and that they should know the major principles and the frameworks that sustain these technologies in order to exploit these to the full. Experience has demonstrated that technology and digital media combined with holistic awareness, with other disciplines, can be used effectively to contribute to the development of best practice in the cultural heritage field and in museums, benefiting the field as a whole. Leonardo's *Last Supper* and the *Sarcophagus of the Spouses Installation* are discussed as examples in this context.

KEYWORDS

digital humanities, virtual technologies, immersive interactive storytelling, virtual narrative, virtual narrative, holographic techniques, digital technology for heritage interpretation, virtual exhibitions

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