dissemination of archaeological and archaeometric data and, at the same time, raises public awareness to the role of new digital technologies applied to heritage. Several considerations can be made about the potentialities of this type of interactive platforms. It has obvious accessibility advantages, since it can be accessed through an Internet connection from anywhere on the planet. This is especially relevant when we are dealing with a small archaeological site, away from the traditional cultural and touristic centres. Even if this first version of the Virtual Museum is only in Portuguese, it can be converted to a multilingual platform in the future, enhancing its dissemination potential. In a future update, it can also display differentiated information to different publics (specialized or non-specialized) according to their specific interests. Updatability is, in fact, another of the strong points about this platform. It allows a regular update of the virtual exhibitions at relatively low costs, providing the opportunity to showcase many archaeological pieces that otherwise would remain hidden from the public in depositories.

The incorporation of digital technologies in physical exhibitions has also merits on their own. They can enhance the public experience, allowing them to be in touch with aspects of the collection that would normally be impossible or off-limits, and see the objects displayed in a completely different way. New digital technologies have also a certain appeal to younger generations, more familiar with these tools, and could be a way to more effectively put these new publics in contact with the archaeological and cultural heritage.

OBJECTIVENESS VS. SUBJECTIVENESS

NICOLA SCHIAVOTTIELLO

The desire of telling stories by projecting images onto canvas or other means can be traced back to the Palaeolithic (see for example the work of Matt Gatton[11]). If CGI has revolutionized the way we construct, perceive and appreciate our cultural heritage, it is undeniable that it developed from visual arts and science but especially from the legacy of photography and later in conjunction with digital photography. With Sheila's Palomares and Pietro Viscomi we explore the relationship between Industrial Heritage and the transformation of photography from a tool of expression to a mean of documentation and interpretation.

---

11. [www.paleo-camera.com. Access date: 10/03/2016].

VISIONS OF INDUSTRIAL ARCHAEOLOGY: FROM DOCUMENTAL PHOTOGRAPHY TO THE PHENOMENON OF "URBEX"[12]

SHEILA PALOMARES ALARCÓN; PIETRO VISCOMI

Photography is key to the survival and promotion of industrial heritage since the study and disciplinary appraisal of industrial architecture requires photographic representation in addition to architectural plans.[13]

Industrial architectural heritage may be the most ill-treated form of heritage that can be found today (Aguilar, 1998, p. 23). It is a form of heritage that is linked to the concentration of industry in cities and the disappearance of rural life. It therefore has a continuous relationship with the development of urbanisation in cities. Both lack of sensitivity and property speculation have caused a large number of buildings to disappear. The notion of *artistic historical heritage* has changed over time, causing numerous examples of such heritage to be destroyed while others, more fortunately, have been conserved or restored. This situation results, among other things, from the fact that the value of certain buildings or ruins has not being recognised until relatively recently. Numerous Roman constructions, including theatres and amphitheatres, served as quarries for new medieval constructions which were studied, conserved and recognised during the Renaissance. The Gothic period was not classified until the nineteenth century and eclecticism, modernism and art deco were also not recognised for decades although, fortunately, their merits have now been reassessed.

For these reasons, industrial archaeology (Simal, 1989) is a relatively recent discipline. It emerged in Great Britain following a change in public attitude brought about by the large-scale destruction of tangible heritage (including a great deal of heritage associated with the Industrial Revolution) after the Second World War. Different groups of enthusiasts with an interest in specific industries began to publish histories and investigations with which they sought to preserve structures or artefacts. In some cases, these enthusiasts even became personally involved in restoring old machinery. Work such as that carried out by Michael Rix, (*Industrial Archaeology*, 1967) who taught at the University of Birmingham, placed

---

12. Research integrated in the project UID/HIS/00057/2013 - POCI-01-0145-FEDER-007702.

13. This fuels the demand for specialist photography. However, as the professional photographer Duccio Malagamba stated in his master class 'La fotografía de arquitectura' [Architectural photography] that is wrong to think that visits to buildings can be replaced by the information conveyed to those who commission photographs. Visits are irreplaceable. In other words, it is only possible to become deeply acquainted with an architectural structure by visiting it [https://vimeo.com/27490929. Access Date: 10/03/2016].

all these efforts in perspective. Consequently, in 1959, following the publication of one of his paper on the Industrial Revolution in Great Britain, the Council for British Archaeology urged the British Government to draw up norms to inventory and protect national industrial monuments (Martin, 2009, p. 286).

Kenneth Hudson[14] played a key role in the field of European museology and coined the term 'industrial archaeology' when he published the first book on the subject – *Industrial Archaeology: an Introduction* (Hudson, 1963).

Although industrial archaeology emerged in England, ideas about preserving, researching or documenting industrial heritage were developed in many parts of the world. All over the planet, numerous industrial museums devoted to specific themes such as canals, windmills or railways have served to defend and preserve this heritage. In 1978, as a result of all these occurrences, the International Committee for the Conservation of the Industrial Heritage (TICCIH) was set up to promote cooperation in this field.

As this discipline has existed for little more than thirty years, many of its characteristics are yet to be defined. How, for example, to define industrial architecture as a specific subject of study when, in the nineteenth and early twentieth centuries, this aspect of the field was not included in the theory and history of architecture and only a few treatises on engineering engaged with the subject-. (Aguilar, 1998, p. 24-26).

In order to record, interpret and appraise industrial remains correctly it is necessary to have some knowledge of their history, evolution and transformation. Only in this way will it be possible to establish the importance of these buildings in relation to others with similar functions. To this end, it is essential that a process of classification be carried out in order to define their value and establish scientific foundations that support and justify their regeneration or reuse. These foundations can largely be established on the basis of irrefutable documentary sources: photographs.

Images are more than just shop windows. This is certainly true of the architecture-based documentary photography of Bernhard 'Berna' Becher and Hilla Becher. For over forty years, the Bechers recorded the heritage of an industrial past with the zeal of documentary makers, photographing threatened industrial buildings in order to keep memories of them alive.

The couple were the driving forces behind the Düsseldorf School and their photos brought them recognition as conceptual artists and as the photographers who made the greatest contribution to the development of industrial architecture photography, exerting a strong and lasting influence on the generations of artists who came in their wake, including the photographers Andreas Gursky, Thomas Ruff, Thomas Struth and Candida Höfer.

For the couple, the purpose of photography was to depict reality in an objective way and to use technical means to highlight the sculptural value inherent in these buildings, thereby documenting a declining

tradition in the field of construction. Their projects led to their winning the *Leone d'Oro* award for sculpture at the Venice Biennale (1991) for conceiving and photographing industrial structures as if they were genuine 'anonymous' sculptures.

Where subject matter is concerned, the Bechers focused on a particular repertoire of subjects with a rigour that is also evident in the formal aspects of their work, in which very specific boundaries govern the approach to their photographic motifs. They stated that '*through photography, we try to arrange these shapes and render them comparable. To do so, the objects must be isolated from their context and freed from all association*' (Stimson, 2004, quoting T. Liliane, 1989). The result is an inventory of portraits of industrial buildings, images that were not intended to be individual objects (Figure 18) but were conceived to create homogenous groups of constructions. They themselves called these groups '*Typologies*'[15].

The Bechers' project is closely analogous with the work '*The Face of Our Time*' by August Sander (1929).[16] According to the Bechers, Sander made '*portraits of people in the same way that we might portray objects. Sander encouraged them to play their role. Perhaps the objects and plants that we photograph are also able to play their role*' (Grigoriadou, 2010, p.350, quoting James Lingwood, 1996).

_____

15. A term that was also used in their first publication (Becher, B.; Becher H., 1970).

16. Sander's intention was to create an extensive photographic inventory of portraits depicting people of all social classes and occupations living in Germany between the wars. The outlines are clear and everything is in focus, establishing a discourse in which clarity and visibility are essential features.

18. Bernd & Hilla Becher, Water Towers (*Wassertürme*), 1980.
© Bernd and Hilla Becher, Solomon R. Guggenheim Museum, 1981

_____

14. Hudson was a British journalist, museologist, broadcaster and writer (1916-1999).

The Bechers employed such a degree of painstaking rigour that their compositions took on a scientific character that was sufficient to make them resemble a work of biological research (Lange, 2006).

Images of buildings with identical functions shot with a large-format camera from different points of view are exhibited together, encouraging the public to reflect on the forms and structures in order to understand and compare the different architectural subjects, which are suspended in space and an unmentioned time. Neither the place nor the time at which these photographs were taken can be determined. Although separated by years or even decades, they appear to have been taken in the same session.

In an interview with Michael Köhler in 1989, Bernd and Hilla explained that: *'We don't wish to modify anything in the objects that we photograph, which is a principle that we continue to apply today. We have allowed ourselves, and still allow ourselves, to play just one trick, which consists of isolating the different objects; that is, situating them separately in the centre of the image, which does not correspond to reality as these objects are usually in the midst of chaos, or architectural jungles'* (Köhler, 1989, p. 14-15).

Human figures are absent from the constructions. The architectural structures are placed against a cloudless morning sky or seen on cloudy days with a diffuse light coming from no discernible direction and casting no perceptible shadow.

Over the past few years, in parallel with the Bechers' documentary vision, *'other photographic gazes'* have been developed to reflect on changes in the industrial landscape, manufacturing processes and their relations with society, and the influence of industry on people and nature. In some cases, the presence of the architectural structure is marginal: contrary to what is seen in the Bechers' photographic compositions, only the type of structure can be distinguished. This is true, for example, of 'Vlad #1 (silo boy)' (figure 19), an image created by the American photographer Jim Gold-berg as part of the *'Open See'* project[17], in which the theme of industrial heritage appears to be completely secondary and the architectural structure serves only as a setting and a backdrop.

Nevertheless, this photo was chosen by Urs Stahel[18] for the exhibition *'Industria, oggi'* (2015) at MAST in Bologna, where photographs by 24 contemporary photographers were brought together with the aim of representing industry and triggering reflections around the representation of industrial landscapes.

'Another gaze' is the phenomenon of urban exploration (Urbex), which is becoming increasingly prominent in the world of industrial heritage representation. In general terms, it refers to the exploration of abandoned and, in most cases, hidden man-made structures and almost always involves photographic documentation.

It is an approach to architecture that is situated somewhere between artistic and documentary practices. Aside from offering opportunities for adventure and play, it is a way of recording and inventorying changes to industrial structures that immortalize an invaluable heritage of buildings and places in post-industrial society, structures that, in most cases, enter our visual field without being appreciated. According to the anthropologist Marc Augè:*'The contemplation of ruins grants us a fleeting glimpse of the existence of a time which is not the time discussed in history books or that which restoration works attempt to resurrect. It is a pure time to which no date can be assigned and which is not found in our world of images, simulacra and reconstructions, which is not located in our violent world, a world whose rubble, absences of time, has not yet managed to become ruins. It is a lost time which art is responsible for recovering'* (Augé, 2003, p.7).

Thanks to the internet, there has been an exponential growth in web pages, communities and fora that, albeit ephemerally, acquaint us with heritage in real time, since there are as many opportunities for such heritage to be known as to be forgotten. Everything depends on the strength of the images that depict it.

This point is relevant to the work of the urban explorer who goes by the name of Ralph Mirebs. In June 2015, Mirebs posted a series of photos on his LiveJournal webpage[19] which were seen around the world in just a few days. It was the first time that such high-quality images of the MZK building (Assembly and Fuelling Complex) and its contents had come to light (figures 20 and 21). Moreover, the way in which Mirebs tells the 'story' of industrial heritage is very interesting as he focuses not only on the images themselves but also on conveying historical and documentary information through photography as well as its social repercussions. One of the consequences of this 'other gaze' is that the media once again began discussing 'secret space shuttles': the remains of the USSR's most costly space project, which, for over twenty years, remained hidden from the public in an abandoned hangar – the Baikonur Cosmodrome – on the vast steppes of Kazakhstan.
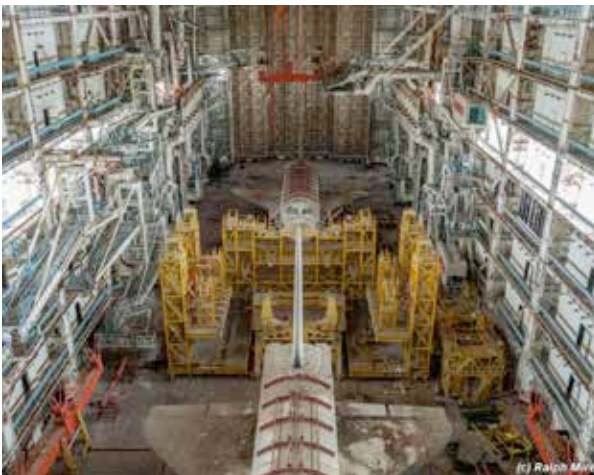
---

19. http://ralphmirebs.livejournal.com/

19. Jim Gold-berg, *Vlad #1 (silo boy, Ukraine)*, Open See, 2006. © Jim Gold-berg, Courtesy of the artist and Pace/MacGill Gallery, New York

---

17. This photograph is part of a project for which Goldberg travelled around the world, documenting his encounters with the homeless, migrants and refugees.
18. Commissioner of the MAST (Manifattura di Arti, Sperimentazione e Tecnologia) photo gallery.

20. Ralph Mirebs, Edificio MZK de Baikonur (Complejo de Montaje y Carga de Combustible), 2015. © Ralph Mirebs

21. Ralph Mirebs, La lanzadera 2K dentro del edificio denominado MZK (Complejo de Montaje y Carga de Combustible) de Baikonur, 2015. © Ralph Mirebs

THE DIGITAL REALM

NICOLA SCHIAVOTTIELLO

What are the implications and specifications of hyper realistic images realized through CGI in a world that is continuously reproduced and interpreted by digital photography? Can the two techniques be seen as distinct ones or are they already considered as a unified medium? 3D documentation and 3D digital reconstruction can be considered complementary phases and equally important for the digital preservation of a particular site or artefact. Moreover, these are non-invasive technique that allows reaching an understanding of the studied object without any risk by also permitting further investigation if needed. On a more practical level 3D documentation is not only useful for digital investigation but extremely important for the work of restoration and conservation, by giving the possibility of approaching the best possible solutions after an accurate study of the digital model. 3D data obtained by either photogrammetry techniques or by laser scanning (or a mix of the two) are also extremely useful for a series of other required 2D data (that previously to these techniques were harder to obtain) such as maps, plans, cross-sections and orthoimages. Therefore, having a complete 3D model, that includes also high resolution texture mapping, can speed up the process of investigating a particular site, ruin, or artefact.

Full 3D digital reconstruction is to be considered very important during the investigation and research stage for a more experiential approach and especially during dissemination. Virtual Anastylosis is also a very interesting technique obtained from the marring of 3D documentation and 3D digital reconstruction. It can result quite effective when parts of the studied subject still exist, so that thorough comparative analysis the full object can be reconstructed.

With the advent of cheaper 3D printers, we saw the emerging of the production of replicas for small and medium size objects, these has open great possibility in terms of accessibility to artefacts that usually where restricted to specialists due to their fragile state of conservation. This has almost happened in conjunction with the appearing of Augmented Reality applications where the digital object can be viewed in a physical environment. With devices such as the HoloLens from Microsoft[20], the boundaries that divide the virtual and the real word will rapidly fade. Finally, if we also consider that digital models could be accessible online--onsite and online-offsite throughout web-visualization technologies the possibilities are becoming very interesting. This can bring a totally new way of dealing with important real-time information that would be very difficult to access otherwise.

Photogrammetry and laser scanner are the main tools used in order to obtain digital replicas that are explorable from every angle rather than from a single perspective. These digital replicas can facilitate the comprehension of the artefacts by capturing the extra dimension, also by adding a layer of objectiveness. However, by doing so we are still de-contextualizing the studied objects. Therefore, we discussed if archaeology itself is an infinitive process of de-contextualization and re-contextualization that once we were making with analogue means and now we may be still doing with the digital ones.

With the help of virtual reality in museums and of augmented reality *in situ*, we could explore if these are effective devices of communication, that permit also the re-contextualization of the studied objects for a better understanding of its meaning and not only for their form and consistency. For the last presentation, we invited Belén Jiménez Fernández-Palacios, who gave an excellent inside of new 3D technologies to revalue archaeology. In fact, from her intervention we clearly understood how the many complex steps for creating digital 3D models are performed before arriving to the final audience. She showed how "the latest developments in 3D recording and modeling offer great potentialities for the accurate

---

20. Using HoloLens in identifying archaeological finds [https://microsoftstudios.com/hololens/shareyouridea/idea/using-hololens-in-identifying-archaeological-finds/. Access date: 18/03/2016].

and detailed 3D documentation and digital preservation of existing tangible heritages and a large number of tools to make digital heritages more informative, easier to be visited and enjoyed even remotely. The data recorded in 3D can be used for several purposes, such as archaeological studies and analyses of architectural structures, digital documentation, preservation and conservation, 3D repositories and catalogues, virtual reconstruction, computeraided restoration, virtual anastylosis, physical replicas, virtual and augmented reality applications, monoscopic or stereoscopic renderings, multimedia museum exhibitions and virtual visits, archaeological prospection, web access, visualizations and so on" (Jiménez et al., 2013, p. 85-89).

CONCLUSIONS

Dealing with historical, archaeological and architectural documentation, cultural heritage interpretation, digital storytelling, computer-based visualization and cognitive response of the public, this discussion lies at a cross road of different studies and disciplines. The basic questions that inform its lay were: how are cultural heritage scientific information studied and interpreted? How are cultural heritage interpretations received by the public, with focus on interpretation with computer-based visualization? Finally, is the rendering of digital artefact and environments an effective way of communication and is it reviving the pleasure of learning about our past, or is it generating a totally a new realm? We saw how the technique de-contextualizing, that in beginning of the 70's has brought with photography a new way of studying the artefacts, can be re-applied with modern technologies by creating a 3D digital model. What seems to be equally important nowadays and difficult to achieve without CGI, is the process of re-contextualization of the artefacts. This opens amazing possibilities for scientific interpretation and interpretation for the public. After all it appears that both processes are necessary for the purposes of understanding, however while the former can be used as a scientific investigation tool, so that by experiencing the reconstructed realm new questions and theories can be formulated, the latter has a very important role in transmitting the same theories to a more general audience in an appealing visual and storytelling form. Within public communication, Mateos Rusillo defines cultural heritage interpretation as: '...*a creative process of strategic communication that helps to connect intellectually and emotionally the visitors with the meaning of the visited heritage resource, so that he/she will appreciate it and enjoy it'* (Mateos, 2008, p. 58), the binomial relationship between the supplier of the knowledge and the receptors was then the focal point of this debate. Moreover, this relationship can be explored as a two-way direction were the public is not the passive recipient of data but has the capacity to choose objects that catches its interest and create its own path of discover through interactivity.

We acknowledge that the multi-disciplinary engagement with a 3D model at a research stage is probably one of the most important phases when building the model itself, as Opgenhaff and Sepers pointed out: '*It is not the 3D reconstruction of ancient architecture that proves something by itself, but it is how we engage with the model in order to unravel how someone in the past might have engaged with it.'* (Opgenhaff and Sepers, 2014, p. 411). However, we can also sustain another level of public engagement, which happens during the fruition of the final model and its related story. We agreed that this should be presented with valid scientific traceable contents, in order to furnish the public with a product that can be traced back to the original research. This final stage should always have an appealing and emotional visual form, otherwise the risk creates merely conceptual models, only to be decoded by the specialists.

We explored different means used to tell a story, which are central elements for the construction of an effective communication. We have seen how CGI visuals accompanied by audio and written words are still the mainstream. However even if we could not expand on this topic at this stage we know that visual immersive, touch, gesture recognition and smell devices are also becoming very popular in recent applications. Therefore, we are often presented with multimodal examples that enhance the experience of the final user (Adolina *et al.*, 2009).

Sometimes and especially with the advent of immersive environments when presenting 3D reconstruction in cultural heritage, the technology has touched the viewer more than the content itself. This especially happens with 3D applications within museums, directed to a general audience. Therefore, we have to be cautious in amazing the final user with spectacular devices without choosing the most appropriate ones for its content and settings (Londoncharter, 2009).

Here we can feel a pattern starting to emerge, so that if the construction of our cultural history through scientific means (especially the one used in archaeological practice) has revealed a complex process that must be approached by different disciplines (*The Seville principles 2011*), maybe the same digital reconstruction by new technological means should follow the same path by using multidisciplinary at the research stage but also multimodality and targeting when communicating with the final audience.

We hope that with this discussion we touched the main issues when CGI storytelling is used for the visualization of cultural heritage models and environments, until when some of today's issues will be transformed into effective new strategies for research, study and public interpretation of our beloved Heritage.

BIBLIOGRAPHY

AGUILAR CIVERA, I. (1998) – *Arquitectura industrial: concepto, método y fuentes.* Valencia: Museo d'Etnología.

ALDERSON, M. (s.d.) – *Connecting with audiences through character emotions.* [https://www.writersstore.com/connecting-with-audiences-through-character-emotions/. Access date: 21/03/2016]

ALLARD, T.; SITCHON, M.; SAWATZKY, R.; HOPPA, R. (2005) – Use of Hand-held Laser Scanning and 3D Printing for Creation of a Museum Exhibit. In MUDGE, M.; RYAN, N.; SCOPIGNO, R., eds., *The 6th International Symposium on Virtual Reality, Archaeology and Cultural Heritage VAST 2005. Short and project papers.* [http://public-repository.epoch-net.org/publications/VAST2005/shortpapers/. Access Date: 20/05/2015].

ANDOLINA, S.; SANTANGELO, A.; CANNELLA, M.; GENTILE, A.; AGNELLO, F.; VILLA, B. (2009) – Multimodal virtual navigation of a cultural heritage site: The medieval ceiling of Steri in Palermo. In LOBELO, L.; IANNIZZOTTO, G., eds., *Proceeding of the 2nd International Conference on Human System Interaction.* Catania: IEEE, p. 562-567.

AUGÉ, M. (2003) – *El tiempo en ruinas.* España: Gedisa.

BANHAM, R. (1989) – *La Atlántida del hormigón: edificios industriales de los Estados Unidos y arquitectura moderna europea, 1900-1925.* Madrid: Editorial Nerea.

BAUDRILLARD, J. (1981) – *Simulacres et simulations.* Paris: Galilée.

BECHER, B.; BECHER H. (1970) – *Anonymous Sculptures. A typography of technical constructions.* Düsseldorf: Art-Press.

BECHER, B.; BECHER H. (2006) – *Grain elevators.* Cambridge: The MIT Press.

BECHER, B.; BECHER H.; ZEITE, A. (2004) – *Typologies.* Cambridge: The MIT Press.

BEIRÃO, C.; GOMES, M.; GOMES, R. SILVA, C.; SOARES, J. (1987) – Um depósito votivo da II Idade do Ferro, no sul de Portugal, e as suas relações com as culturas da Meseta. In GORROCHATEGUI, J; MELENA, J.; SANTOS, J., *Stvdia Paleohispanica. Actas del IV coloquio sobre lenguas y culturas paleohispánicas.* Vitoria-Gasteiz: Instituto de Ciencias de la Antigüedad, Universidad del País Vasco, p. 207-221 (Veleia, 2/3- separata).

BEIRÃO, C.; SILVA, C.; SOARES, J.; GOMES, M.; GOMES, R. (1985) – Depósito Votivo da II Idade do Ferro de Garvão: notícia da primeira campanha de escavações. *O Arqueólogo Português*, IV.ª série, 3, p. 45-136.

BENDICHO, V. (2013) – International Guidelines for Virtual Archaeology: The Seville Principles, In CORSI, C.; SLAPSAK, B.; VERMEULEN, F., eds., *Good practice in archaeological diagnostics: non-invasive survey of complex archaeological sites: non-invasive survey of complex archaeological sites. Natural science in archaeology.* Heidelberg: Springer, p. 269-283.

BRUNO, F.; BRUNO, S.; SENSI, G.; LUCHI, M.; MANCUSO, S.; MUZZUPAPPA, M. (2009) – From 3D Reconstruction to Virtual Reality: a complete methodology for digital archaeological exhibition. *Journal of Cultural Heritage*, 11, p. 42-49.

CARVALHO, J.; PENICHEIRO, F. (2009) – "Jogos de Computador" no Ensino da História. In VELOSO, A.; ROQUE, L.; MEALHA, Ó., eds., *Livro de Actas do VIDEOJOGOS 2009 – Congresso da Sociedade Portuguesa de Ciências dos Videojogos.* Aveiro: Universidade de Aveiro, p. 401-412 [http://www3.ca.ua.pt/videojogos2009/default.html. Access Date: 01/02/2016].

CHOUQUER, G. (2012) – *L'Analyse de Morphologie Urbaine: l'example de Beja (Portugal).* Coimbra: Centro de Estudos Arqueológicos das Universidade de Coimbra e Porto.

DAVERIO, P.; TRAPANI, V. (2013) – *Il design dei beni culturali: crisi territorio identità - Cultural Heritage design: crisis territory identity.* Milano: Rizzoli, p. 18-22.

DENARD, H., ed. (2009) – *The London charter. For the computer-based visualization of Cultural Heritage*, Version 2.1 [http://www.londoncharter.org/downloads.html. Access date: 22/01/2016].

DIAS, R. (2014) – *Reconstituição digital em Património - Os castelos de Vimioso e Monforte de Rio Livre.* Porto: Faculdade de Letras da Universidade do Porto (Master Tesis).

DIAS, J., ed. (2015) – *Livros das Fortalezas de Duarte de Armas.* Casal de Cambra: Caleidoscópio.

ELGEWELY, E.; WENDRICH, W. (2015) – Virtually united in real time: Museum collections and archaeological context explored. In GUIDI, G.; SCOPIGNO, R.; TORRES, J.; GRAF, H., eds., *Proceedings of the 2015 Digital Heritage International Congress.* Vol. 2. Granada: IEEE, p. 659-662.

ESPANCA, T. (1975) – *Inventário artístico de Portugal: Distrito de Évora.* Vol. I. Lisboa: Academia Nacional de Belas Artes.

FAIA, E. (2012) – *Entre Deuses e Homens: os grandes contentores cerâmicos do Depósito Votivo de Garvão.* Coimbra: Faculdade de Letras da Universidade de Coimbra (Master Thesis).

FERNIE, K.; RICHARDS, J., eds. (2003) – *Creating and Using Virtual Reality: a guide for the Arts and Humanities.* Oxford: Oxbow.

FIGUEIREDO, C. (2016) – A Reconstituição Arqueológica – uma tradução visual. *Revista Al-Madan Online*, II.ª série, 20: 2, p. 6-13.

FIGUEIREDO, C.; APARÍCIO RESCO, P. (2014) – *Escala de Evidência Histórica/Arqueológica, César Figueiredo Illustration.* [http://www.cesarfigueiredo.com/#!blogger-feed/c1dpo. Access date: 25/03/2016].

FIORILLO, F.; JIMÉNEZ FERNÁNDEZ-PALACIOS, B.; REMONDINO, F.; BARBA, S. (2012) – 3D Surveying and modelling in the archaeological area of Paestum, Italy. *VAR*, 4: 8, p. 55-60.

FONSECA, J., coord. (1985) – Arquivo Documental: o Concelho de Montemor-o-Novo nas Memórias Paroquiais de 1758; Passagem por Montemor-o-Novo da rainha D. Maria II e rei D. Fernando II em Outubro de 1843. *Almansor*, 1.ª série, 3, p. 121-189.

GILLINGS, M. (1997) – Engaging Place: a Framework for the Integration and Realisation of Virtual-Reality Approaches in Archaeology. In DINGWALL, L.; EXON, S.; GAFFNEY, V..; LAFLIN, S.; VAN LEUSEN, M., eds., *Archaeology in the Age of the Internet. CAA97. Computer Applications and Quantitative Methods in Archaeology. Proceedings of the 25th Anniversary Conference.* Oxford: BAR, p. 247-254 (BAR International Series, 750).

GILLINGS, M. (2000) – Plans, Elevations and Virtual Worlds: the development of techniques for the routine construction of hyperreal simulations. In BARCELÓ, J.; FORTE, M.; SANDERS, D., eds., *Virtual Reality in Archaeology.* Oxford: BAR, p. 59-69 (BAR International Series, 843).

GRIGORIANDOU, E. (2010) – *El archivo y las tipologías fotográficas. De la Nueva Objetividad a las nuevas generaciones de fotógrafos en Alemania: 1920-2009.* Barcelona: Universitat de Barcelona (PhD Thesis). [http://hdl.handle.net/10803/53533. Access date: 10/03/2016].

GRILO, C. (2007) – A Rua do Sembrano e a Ocupação Pré-Romana de Beja. *Vipasca: Arqueologia e História*, 2.ª série, 2, p. 261-268.

GROS, P. (2011) – *L'Architecture Romaine du début du IIIe siècle av. J.-C. à la fin du Haut-Empire: 1. Les monuments publics, Les Manuels d'Art et d'Archéologie Antiques.* Paris: Éditions A. et J. Picard.

HAUSCHILD, T. (1986) – Investigações efectuadas no templo de Évora em 1986. *Trabalhos de Arqueologia do Sul*, 1, p. 93-98.

HAUSCHILD, T. (2010) – Algumas observações nas construções do foro de Ebora Liberalitas Iulia. *Studia Lusitana*, 4, p. 27-36.

HAUSCHILD, T.; SARANTOPOULOS, P. (1995/1997) – O Tanque de Água do Templo Romano de Évora. *O Arqueólogo Português*, IV.ª série, vol. 13/15, p. 429-440.

HUDSON, K. (1963) – *Industrial Archaeology: an Introduction*. Londres: J. Baker.

INCERTI, M.; IURILLI, S. (2015) – Schifanoia Palace in Ferrara. A Virtual Storytelling for its knowledge and dissemination. In GUIDI, G.; TORRES, J.; SCOPIGNO, R.; GRAF, H., eds., *Proceedings of the 2015 Digital Heritage International Congress*. Vol. 2. Granada: IEEE, p. 495-502.

JIMÉNEZ FERNÁNDEZ-PALACIOS B.; RIZZI, A.; REMONDINO, F. (2013) – Etruscans in 3D - Surveying and 3D modeling for a better access and understanding of heritage. *VAR*, 4: 8, p. 85-89.

JIMÉNEZ FERNÁNDEZ-PALACIOS, B.; NEX, F.; RIZZI, A.; REMONDINO, F. (2015) – ARCube - The Augmented Reality Cube for Archaeology. *Archaeometry*, 57: 1, p. 250-262.

JIMÉNEZ FERNÁNDEZ-PALACIOS, B.; STEFANI, C.; LOMBARDO, J.; DE LUCA, L.; REMONDINO, F. (2013) – Web visualization of complex reality-based 3D models with NUBES. In ADDISON, A.; GUIDI, G.; DE LUCA, L.; PESCARIN, S., eds., *Proceedings of the 2013 Digital Heritage International Congress*. Vol. 1. Marseille: IEEE, p. 701-704.

KIST, Korea Institute of Science and Technology (2014) – *3-D printer to aid the visually impaired students in their educational endeavors*. [www.sciencedaily.com/releases/2014/07/14 0702102601.htm. Access date: 23/04/2016].

KÖHLER, M. (1989) – *Künstler. Kritisches Lexikon des Gegenwartskunst, #7*, Munich, p. 14-15.

LANGE, S. (2006) – *Bernd and Hilla Becher: Life and Work*. Cambridge: The MIT Press.

LANJOUW, T. (2014) – Discussing the obvious or defending the contested: why are we still discussing the 'scientific' value of 3D applications in archaeology? In KAMERMANS, H.; NEEF, W.; PICCOLI, C.; POLUSCHNIY, A.; SCOPIGNO, R, eds., *The Three Dimensions of Archaeology. Proceedings of the XVII UISPP World Congress*. Vol. 7, Oxford: Archaeopress Publishing, p. 13-23.

LEBOWITZ, J.; KLUG, C. (2011) – *Interactive storytelling for video games a player-centered approach to creating memorable characters and stories*. Burlington: Focal Press.

LEPOURAS, G.; VASSILAKIS, C. (2004) – Virtual Museums for all: Employing Game Technology for Edutainment. *Virtual Reality Journal*, 8: 2, p. 96-106.

LÉVY, P. (1996) – *O que é o Virtual?* São Paulo: Editora 34.

LIMONCELLI, M. (2012) – *Il Restauro Virtuale in Archeologia*. Rome: Carocci Editore.

LINGWOOD, J. (1996) – The Music of the Blast Furnaces: Bernhard and Hilla Becher in conversation with James Lingwood. *Art Press*, 209, p. 27-28.

LOPES, G. (2008) – A Ermida de Santo André do Outeiro. Uma abordagem de arqueologia da arquitectura. *Revista Almansor*, 2.ª série, n.º 7, p. 55-80.

LOPES, M. (1996) – O Território de Pax Iulia: limites e caracterização. *Arquivo de Beja*, IV.ª série, 2/3, p. 63-74.

LOPES, M. (2003) – *A Cidade Romana de Beja: percursos e debates em torno de Pax Iulia*. Coimbra: Instituto de Arqueologia da Faculdade de Letras de Coimbra (Anexos de Conimbriga, 3).

LOPES, M. (2010) – Arqueologia das Cidades de Beja: um projecto da ciência da epiderme das terras que emergem. *Conímbriga*, vol. XLIX, p. 69-86.

MACIEL, J. (2006) – *Vitrúvio, Tratado de Arquitectura*. Lisboa: Instituto Superior Técnico.

MARTIN, P. (2009) – Industrial Archaeology. In MAJEWSKI, T.; GAIMSTER, D., eds., *International Handbook of Historical Archaeology*. Berlin: Springer, p. 285-297.

MATEOS RUSILLO, S., coord. (2008) – La comunicación global del patrimonio cultural. Del marco teórico al estudio de casos. Gijón: Trea.

MAYORGAS, P. (2012) – La escuela de Dússerdolf y el cine de Wim Wenders. *Revista Fotocinema*, 4, p. 88-119.

MILGRAM, P.; KISHINO, F. (1994) – A Taxonomy of Mixed Reality Visual Displays. *IEICE Transactions on Information Systems*, vol. E77-D: 12, p. 1321-1329.

OPGENHAFFEN, L.; SEPERS, M. (2015) – 3D Modelling: crossing traditional boundaries between different research areas. In GONZALEZ-AGUILERA, D.; REMONDINO, F.; BOEHM, J.; KERSTEN, T.; FUSE, T., eds., *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Vol. XL-5/W4. Avila: ISPRS, p. 411-414 [http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/index.html. Access Date: 05/04/2016].

MUNICÍPIO DE MONTEMOR-O-NOVO (2010), *Inventário do Património Arquitectónico e Arqueológico do Concelho de Montemor-o-Novo – Relatório de Construção de Base de Dados*. Montemor-o-Novo: Serviço de Património Cultural do Município de Montemor-o-Novo.

RENFREW, C.; BAHN, P. (2005) – *The Key Concepts*. New York: Routledge.

SANDER, A. (1929) – *Antlitz der Zei*. Munchen: Kurt Wolffverlag.

SILVA, M. (2012) – *Os Queimadores do Depósito Votivo de Garvão*. Coimbra: Faculdade de Letras da Universidade de Coimbra (Master Thesis).

SOBRINO SIMAL, J. (1989) – *Arquitectura industrial en España (1830-1990)*. Madrid: Banco de Crédito Industrial.

STAMPER, J. (2005) – *The Architecture of Roman Temples: the Republic to the Middle Empire*. Cambridge: Cambridge University Press.

STIMSON, B. (2004) – The Photographic Comportment of Bernd and Hilla Becher. *Tate Papers*, 1. [http://www.tate.org.uk/research/publications/tate-papers/01/photographic-comportment-of-bernd-and-hilla-becher. Access Date: 05/04/2016].

TERNIE, S.; KLEMKE, R.; KALZ, M.; ULZEN, P.; SPECHT, M. (2012) – ARLearn: Augmented Reality Meets Augmented Virtuality. *Journal of Universal Computer Science*, vol. 18: 15, p. 2143-2164.

The Seville principles 2011. International principles of virtual archaeology. Final draft. [http://smartheritage.com/seville-principles/seville-principles. Access date: 22/01/2016].

TILDEN, F. (2007) – *Interpreting our heritage*. Chapel Hill: University of North Carolina Press.

TOURAINE, L. (1989) – Bernd and Hilla Becher: The Function doesn't make the Form. *Artefactum*, April/May, p. 9.

VIANA, A. (1942) – O Templo Romano de Pax Iulia. *MVSEV*, I, p. 199-207.

VIANA, A. (1947) – Restos de um Templo Romano em Beja. *Arquivo de Beja*, I.ª série, 4, p. 77-88.

WEB PAGES

http://italicaromana.blogspot.pt

http://ralphmirebs.livejournal.com/

http://www.benoitdereau.com

http://www.economist.com/blogs/prospero/2013/08/rise-documentary-film

http://www.lumenrt.com

http://www.montemorbase.com

http://www.paleo-camera.com

http://www.sketchfab.com

http://www.uc.pt/noticias/07_NL_2010/nUC01_072010

https://idre.ucla.edu/research/active-research/vsim

https://lumion3d.com

https://microsoftstudios.com/hololens/shareyouridea/idea/using-hololens-in-identifying-archaeological-finds/

https://www.youtube.com/watch?v=TnBuJ1PM2TA