



Research Article

Thiago Minete Cardozo, Costas Papadopoulos*

Heritage Artefacts in the COVID-19 Era: The Aura and Authenticity of 3D Models

<https://doi.org/10.1515/opar-2020-0147>

received December 8, 2020; accepted June 4, 2021

Abstract: Museums have been increasingly investing in their digital presence. This became more pressing during the COVID-19 pandemic since heritage institutions had, on the one hand, to temporarily close their doors to visitors while, on the other, find ways to communicate their collections to the public. Virtual tours, revamped websites, and 3D models of cultural artefacts were only a few of the means that museums devised to create alternative ways of digital engagement and counteract the physical and social distancing measures. Although 3D models and collections provide novel ways to interact, visualise, and comprehend the materiality and sensoriality of physical objects, their mediation in digital forms misses essential elements that contribute to (virtual) visitor/user experience. This article explores three-dimensional digitisations of museum artefacts, particularly problematising their aura and authenticity in comparison to their physical counterparts. Building on several studies that have problematised these two concepts, this article establishes an exploratory framework aimed at evaluating the experience of aura and authenticity in 3D digitisations. This exploration allowed us to conclude that even though some aspects of aura and authenticity are intrinsically related to the physicality and materiality of the original, 3D models can still manifest aura and authenticity, as long as a series of parameters, including multimodal contextualisation, interactivity, and affective experiences are facilitated.

Keywords: aura, authenticity, 3D models, cultural heritage, remediation, technological mediation, survey, qualitative interviews

1 Introduction

The COVID-19 pandemic and the necessary physical and consequent social isolation made clear the increasing need for more (but also better) digital content. Recent reports have highlighted that providing digital content in different forms is considered one of the most effective means of keeping audiences engaged. UNESCO's report on "Museums Around the World in the Face of COVID-19" (UNESCO, 2020), for example, emphasises that the pandemic allowed many institutions to utilise previous digitisation investments, including 360° tours, virtual museums, and digital exhibitions, while increasing their outreach on social media platforms (pp. 15–16). Many institutions, in most cases those with sufficient resources, also developed new atypical projects during the lockdown, including educational challenges

Article note: This article is a part of the Special Issue on Art, Creativity and Automation. Sharing 3D Visualization Practices in Archaeology, edited by Loes Opgenhaffen, Martina Revello Lami, Hayley Mickleburgh.

* **Corresponding author: Costas Papadopoulos**, Faculty of Arts and Social Sciences, Department of Literature & Art, Maastricht University, Maastricht, The Netherlands, e-mail: k.papadopoulos@maastrichtuniversity.nl

Thiago Minete Cardozo: Instituto Oi Futuro, Rio de Janeiro, Brazil, e-mail: thiagominete@gmail.com

and behind the scenes. The report on “Museums, Museum Professionals and COVID-19” by the International Council of Museums (ICOM – International Council of Museums, 2020) confirms that museums’ digital services increased after the lockdown, almost by 50% for social media and in the range between 10% and 19% for online collections and exhibitions, podcasts, quiz contests, newsletters, and live events (p. 10). Also, the report on the “Impact of the COVID-19 Situation on Museums in Europe” by the Network of European Museum Organisations (NEMO – Network of European Museums Organisation, 2020) calls for more investment in digital heritage, including both digital services and engaging digital experiences, recognising that they “bring[ing] people together, encourage[ing] creativity...and offer[ing] a virtual space to build ideas collectively” (p. 3).

It is not a coincidence that the European Commission also launched in June 2020 a public consultation on digital access to European Cultural heritage to revise the 2011 Recommendation (EUR-Lex – European Union Law, 2011) on the digitisation and online accessibility of cultural material and digital preservation. It is worth noting that the 2011 Recommendation did not include a reference to 3D digitisation (only to audiovisual content) contrary to the 2020 consultation survey that addressed questions on the role of 3D technologies in cultural heritage, including the value of “digital twins,” for example, in the case of Notre Dame, the creation of high-quality 3D models of museum objects before they get lost due to theft or damage, online visualisation of heritage monuments, and immersive experiences. It is clear that 10 years after the previous recommendation and in light of recent cases of heritage loss and inaccessibility, priorities have shifted to more technologically advanced and engaging digital solutions. Similar recent initiatives by the European Commission (EC – European Commission, 2020) such as the report on the “Basic Principles and Tips for 3D Digitisation” and the study on the quality in 3D Digitisation of tangible cultural heritage led by the Cyprus Institute of Technology, which was launched in September 2020 (CIT – Cyprus Institute of Technology, 2020), also aim to respond to the increasing need for the (3D) digitisation of tangible heritage.

Within this context, we ought to explore more closely the 3D digitisation of material culture. The remediation of physical artefacts into three dimensions brings new possibilities of interaction, including digital manipulation and engagement with multimodal contextualisation. However, it also brings challenges: 3D models miss essential qualities of the original objects, such as their physical substance and location (Jeffrey, 2015, p. 146). The objects’ physical context is also missing, for example, museum rooms and corridors, neighbouring artefacts and related collections, as well as interactions within and among visiting groups, are absent from most 3D digitisations; therefore, the personal, physical, and social contexts (Falk & Dierking, 2016; Grüner, Specker, & Leder, 2019, p. 2) that form museum experiences cannot be easily or meaningfully integrated – let alone replicated – into 3D models (also see Vayanou, Katifori, Chrysanthi, & Antoniou, 2020 on the social dimension of virtual heritage experiences in the times of COVID-19). As a result, the experience that one has with a 3D heritage artefact and consequently user actions and perceptions are mostly mediated through technology (Moens, 2018, p. 75). Therefore, we ought to problematise how our understanding and appreciation of heritage artefacts change through technological mediation. To explore the latter, two key concepts need to be discussed: aura and authenticity.

Drawing from Walter Benjamin’s seminal work (1968/2007) and from the authors who discussed and further elaborated on his ideas (Cameron, 2007; Di Giuseppantonio Di Franco, Galeazzi, & Vassallo, 2018; Douglas-Jones, Hughes, Jones, & Yarrow, 2016; Garstki, 2016; Holtorf, 2013; Jeffrey, 2015; Jeffrey, Hale, Jones, Jones, & Maxwell, 2015; Latour & Lowe, 2011), including a discussion of aura in the digital realm (Coleman, 2014; Jones, Jeffrey, Maxwell, Hale, & Jones, 2017; Kenderdine & Yip, 2018; MacIntyre, Bolter, & Gandy, 2004), we define aura as the experience one has with a heritage artefact that triggers a personal, emotional response, a feeling of awe and excitement of being in front of something that is part of a bigger past. Authenticity, on the other hand, is defined based on the qualities of an artefact that make it being perceived as an object of the past. This includes its biography and testimony of the passage of time and is also influenced by the authority of the institution exhibiting it as well as the social and cultural meaning assigned to it by different communities. In this article, we treat aura as an integral part of authenticity, arguing that authentic artefacts should be able to induce auratic experiences on viewers; however, auratic experiences alone cannot infuse authenticity into an artefact.

Building on several studies that have problematised these two concepts for heritage artefacts, this article embarks on establishing an exploratory framework aimed at evaluating the experience of aura

and authenticity in 3D digitisations of cultural heritage. By using two 3D models as case studies, the Rosetta Stone (British Museum) and the Lewis Chess Pieces (National Museums Scotland), this article also applies and evaluates this framework via a mixed-method approach. This exploration allowed us to conclude that even though some aspects of aura and authenticity are intrinsically related to the physicality and materiality of the original, three-dimensional digital models can still manifest aura and authenticity, as long as a series of parameters including multimodal contextualisation, affective experiences, and multisensoriality are facilitated. Given the increasing rate of (3D) digitisation and the changes the pandemic has brought in how we experience and interact with cultural heritage, future digitisation initiatives ought to explore more deeply and consider in the shaping of online engagements how people respond to the three-dimensional representations of material culture. It is to be hoped that the proposed framework will provide the means to evaluate such online experiences and better inform future digitisation endeavours.

2 Background

3D digitisation initiatives include those run by heritage institutions (e.g. British Museum, Smithsonian, Fitzwilliam) and non-profit organisations (e.g. CyArk), those supported or endorsed by Governments (e.g. The Scottish Ten) and EU-funding (e.g. 3D-Icons), and smaller scale initiatives that also involve community groups (e.g. Digital Heritage Age; ACCORD). We recognise that in the uncertainty and consequent rush that the pandemic caused, it was almost impossible for museums to invest in this form of engagement and knowledge production if they were not previously actively engaged in it. Even though in the last 10 years (and more intensively in the last five), technological advancements have made possible the 3D digitisation of tangible heritage at a much higher rate, better quality, and lower cost (money, time, people) than it was previously possible, and it still requires expertise and resources that, in most cases, are not readily available in heritage institutions. It is for this reason that there was not any significant increase in the release of 3D models during the pandemic with the exception of 360° virtual tours that were mass produced, which, however, cannot capture the social experience of a museum visit. In addition, most of these virtual tours do not include (adequate) contextual information about the artefacts or works of art, and their quality is not sufficient to closely explore the exhibits and their details; the latter is also quite common in virtual tours pre-COVID-19. On the other hand, institutions with more resources managed to develop more sophisticated virtual tour applications that included annotations, close-ups, and audio narratives, such as the *Van Gogh Museum* in Amsterdam (VGM – Van Gogh Museum, 2020), the *Louvre Museum* in Paris (Louvre, 2020), and the *Maritime Greenwich UNESCO World Heritage Site* (ORNCG – Old Royal Naval College Greenwich, 2020).

In this article, we will not deal with all different types of 3D heritage representations, for example, 360° virtual tours and virtual worlds, but we will problematise the affordances of 3D models, that is, interactive digital objects that have been produced by digitising physical objects with the purpose of communicating cultural heritage to a broader audience. As we have showcased in another article (Papadopoulos, Hamilakis, Kyparissi-Apostolika, & Díaz-Guardamino, 2019), 3D models can also be used to enhance researchers' perspectives on material culture; however, the current article is mostly concerned with their use by the public.

Instead of flat images that we are so accustomed to producing as professionals and consuming as observers/users of heritage content, 3D models offer three-dimensional representations of physical objects that can better evoke corporeal, multisensorial, kinaesthetic, and affective experiences (Papadopoulos et al., 2019, p. 627). Digital manipulation enables a sense of virtual tactility (Di Giuseppantonio Di Franco et al., 2018, pp. 4–5), allowing the observation of and interaction with the minute details of objects' geometry, colour, and texture, thus evoking a contact with their physical counterparts. When 3D models are accompanied by annotations and multimodal contextualisation, they also provide deeper insights into objects' biographies and their context. As a result, 3D models have the potential to enable museum visitors to do more than in physical museums (excluding of course the social aspect of a museum experience; see, for example, Falk & Dierking, 2016, pp. 47–49), where the interaction with artefacts is very often forbidden,

and their context is often described with some minimal information (typically including the type of object, region, culture, and date) and some broader contextualisation for the display case or collection.

A survey conducted with 203 Sketchfab (the leading repository for 3D models) users concluded that providing a wider historical context is very important to better comprehend heritage objects (Lloyd, 2016, p. 864). Other authors also argue that a wider contextualisation is essential to offer a more complete comprehension of digitised heritage artefacts. Hindmarch, Terras, and Robson (2019) have stated, for example, that 3D models can inherit “some of the original’s aura” (p. 251) when they are adequately contextualised (also see Linaza, Juaristi, & Garcia, 2014; Statham, 2019). On the other hand, they maintain that when 3D models are presented isolated and stripped off of their original context, they lose their potential to prompt an affectual response.

However, 3D collections typically follow the exhibition patterns observed in physical museum collections: 3D models are presented with none or very limited contextual information, little or no metadata (or paradata), while not often making use of the affordances of the 3D environments, e.g. by adding (insightful) annotations. Three-dimensional collections of major museums, such as *the British Museum*, *the Smithsonian*, *the Metropolitan*, and *the Victoria & Albert Museum*, are only some representative examples of this. The aforementioned Sketchfab user survey, however, also revealed that annotations alone are not enough since users prefer deeper historical contextualisation. On the other hand, there are examples of initiatives and institutions that have made better use of 3D digitisations by providing contextualisation and embedding them into larger narrative frameworks. For example, *The Invincible Wreck* (Cloud Tour, 2020) combines audio-visual narrative, archival material, and rich annotations, interaction at different levels and with multiple 3D models, all of which provide a coherent narrative about the shipwreck’s biography. With less assets but still in an effective and engaging way, the *British Science Museum Group* (BSMG – British Science Museum Group, 2020) and the *National Museums Scotland* (NMS – National Museums Scotland, 2020) also embedded their 3D models in webpages with enriching multimodal information such as fact lists, figures, and graphics. The BSMG, in particular, also provides lesson plans for using their 3D models in an object-based learning approach before or after visiting the museum or to spark interest and generate discussion in the classroom. An interesting approach has also been followed in the case of the *Near Life: The Gipsformerei – 200 Years of Casting Plaster* by the Staatliche Museen zu Berlin (SMZB – Staatliche Museen zu Berlin, 2020), which digitised the exhibition hall as well as individual exhibits, which were also contextualised by an audio guide and curatorial text content.

Despite the new possibilities that 3D models bring, it remains open how they mediate their affectual power and trigger users’ emotional response; in other words, if and how the aura of the original artefact is transmitted or (re)generated in the digitised three-dimensional model. It is also questionable whether users perceive the 3D models as credible, truthful representations of heritage artefacts, i.e. if 3D models can emanate the authenticity of the original. In a materialist approach, aura and authenticity are seen as inherent characteristics of original, physical objects. The authors who take a materialist perspective (e.g. Douglas-Jones et al., 2016, p. 831; Holtorf, 2013, p. 441) argue that the sense of pastness is directly tied to objects’ physical characteristics. This notion is also present in Walter Benjamin’s seminal ideas on authenticity. The German critical theorist defined authenticity as “the essence of all that is transmissible from its beginning, ranging from its substantive duration to its testimony to the history which it has experienced” (1968/2007, p. 221). For Benjamin, “what is really jeopardized when the historical testimony is affected is the authority of the object, the weight it derives from tradition... What withers in the age of the technological reproducibility of the work of art is the...aura.” (1968/2007, p. 221). According to Rochlitz (1996, p. 152), aura is defined by “the uniqueness of a moment of temporal apparition and its unapproachability, its distancing despite a spatial proximity.”

On the other hand, constructivist approaches challenge the connection of aura and authenticity with objects’ materiality, arguing that they are socially created notions and, thus, can be negotiated among observers, objects, and places (Cameron, 2007; Coleman, 2014; Jeffrey, 2015, 2018; Jones et al., 2017; Latour & Lowe, 2011; MacCannell, 1976; MacIntyre et al., 2004; Walsh, 2007). For some of these scholars, reproductions are, in fact, essential for the aura of the original, since by means of copying and replication, the original retains its unique value (Latour & Lowe, 2011; MacCannell, 1976; Walsh, 2007). Latour and Lowe

(2011, p. 9), for example, argue that the aura of the original can migrate to its representation. Building on the latter, Jeffrey (2015, p. 148) argues that this migration can also occur in digital reproductions. Foster and Jones state that “replicas can be as old and as authentic as we feel them to be” (2018, p. 20), essentially arguing that what matters is the perceived authenticity. They also argue that replicas take their meaning and value from their contexts; for example, *in situ* replicas, placed in heritage sites, replace and stand for something that is missing, whereas replicas in museum contexts develop an independent biography bound up with the story of a new place. For Cameron (2007, p. 67) as well, digital objects can accumulate their own authenticity and aura since they are creative works with their own history and provenance. Other scholars believe that aura – rather than being a matter of originals or copies – is related to the social (MacIntyre et al., 2004) or individual (Coleman, 2014) significance we attribute to any kind of objects.

Several authors have paved the way for the investigation of aura and authenticity in museum artefacts. Cameron and Gatewood (2000, 2003) and Latham (2013) explored transcendental experiences in relation to museum visits, while Hampp and Schwan (2014a, 2014b) focused their studies on authenticity, outlining aspects that differentiate an original from a replica. Although not focused on museum artefacts, De Jong (2018) also contributed to that examination when listing the levels of authentication that a museum exhibition should pass to emanate authenticity. A few studies also investigated the conditions under which 3D representations of heritage objects can evoke aura and authenticity (Jeffrey, 2015, 2018; Jones et al., 2017; Kenderdine & Yip, 2018).

3 The Ten Elements of Aura and Authenticity

The framework proposed in this article is based on previous studies that explored the aura and authenticity of heritage artefacts by deploying visitor/user evaluations and/or developing a theory-informed discussion of the two concepts. Among those who examined user experiences, Cameron and Gatewood (2000) argue that visitors seek transcendental experiences, which are characterized by three parameters. The first is *deep engagement*, in which visitors intensely gaze at a given artefact, losing the sense of the passing of time. The second is *empathy*, in which visitors imagine the experiences, feelings, and thoughts of the people who used these artefacts in the past. The third is *awe or reverence akin*: the feeling of being in the presence of something holy. Although the authors did not explicitly mention aura and authenticity, the three parameters are closely related to what is understood and discussed as the effect of aura and authenticity on museum visitors. Thus, their work represents the first steps in the formulation of a framework for evaluating auratic experiences in museums, as also argued by Kenderdine and Yip (2018, p. 14).

Cameron and Gatewood’s findings were further developed by Latham (2013). Taking a phenomenological approach, the author interviewed participants to delve deeper into their transcendental experiences with museum artefacts. She identified four themes that are essential for this phenomenon: unity of the moment, object link, being transported, and connections bigger than self (pp. 8–11). *Unity of the Moment* is described by Latham as the bubble established between the viewer and the object in which the other three essences occur. For *Object Link*, the artefact acts as a trigger to stimulate perceptions, thoughts, and feelings. In the feeling of *Being Transported*, visitors feel like they are alone and transported back to the artefact’s era, also experiencing alterations in their conception of space and time. Finally, *Connections Bigger than Self* refers to deep experiences one develops, often evoking memories and personal stories, as well as sensations of awe and wonder.

On the basis of Latham’s work, Hampp and Schwan (2014a, 2014b) conducted studies to examine authenticity in physical artefacts at the Deutsches Museum. By presenting to participants the original artefacts either as originals or as replicas, the authors found that objects perceived as replicas were able to induce similar effects as the original artefacts (2014b, p. 363). Based on the responses to a survey and interviews with the participants, they identified four factors that differentiate an original from a replica: (a) *history*, since authentic objects prompt a link with the past; (b) *charisma*, since authentic objects are grandiose and have an awe effect; (c) *rarity*, since heritage artefacts are usually unique (or at least scarce)

and cannot be created in the same way as in the past; and (d) *functionality*, since authentic objects should function in the same way they functioned in the past. Hence, they concluded that the way objects are presented has a strong influence on visitors' perception of authenticity. They also highlighted that museums' reputation can also confer authenticity even to replicas (pp. 363–364).

Steffi de Jong has problematised authenticity in museum exhibitions. She argued that to emanate authenticity, an artefact must pass through four levels of authentication (2018, p. 119–122). The first one is *object authentication*, which is assured by the museum's authority: if an object is owned and exhibited by a museum, people tend to assume that it is authentic. The second is *narrative authentication*, which refers to exhibition techniques, such as the way the object is displayed, the room in which it is exhibited, the juxtaposition with other objects, and the use of labels, text, and audio guides that present the object's history. The third is *exhibition authentication* and is related to the design of the exhibition, i.e. how it has been organised and how it prompts the connection between the viewer and the object. The last one is the *visitor experience authentication* according to which viewers are immersed in the museum experience in such a way that they become witnesses of history themselves, thus ensuring the object's authenticity.

A few studies have also investigated aura and authenticity in 3D representations. Kenderdine and Yip (2018), for example, concluded that the migration of the aura from the physical to the digital highly depends on the level of engagement offered by the exhibition: “the proliferation of aura in digital objects is contingent on the presence of transportive and immersive exchanges between viewer and object that connect the viewer to the histories and traditions of the object's cultural trajectory” (p. 23). Jones et al. (2017) have also conducted research focused on the 3D digitisation of heritage sites by analysing a community-based and participatory creation project. The authors note that the process of recording and modelling heritage sites creates a bond among objects, sites, and the people involved, in such a way that places' history becomes tied not only to the 3D models but also to those involved in their design and creation. As such, “the practices involved in the use of 3D technologies create networks of relationships between historic objects, people and places that become part of the biography of the virtual object and mediate the experience of authenticity for all involved” (2017, p. 349). The authors also highlighted evidence of aura migration once social and communal values, including the historical significance of the sites and their symbolic relations to identity, were triggered by collaboratively created 3D representations.

Jeffrey (2015) also argues that digital objects can emanate aura. Building on Latour and Lowe's (2011) arguments according to which the aura of originals can migrate to their reproductions, Jeffrey argues that this migration can also occur in the digital realm under certain conditions (p. 148): democratisation, co-production, and the beauty of digital visualisations. However, he also highlights the “weirdness” of the digital world (p. 145), discussing five features of digital objects (pp. 145–146) that can potentially affect their aura and authenticity: lack of physical location, no substance, no degradation, infinite reproducibility, and lack of ownership. In effect, these characteristics strongly differentiate digital objects from the physical ones and contribute to the feeling that they are too distant from the material world and alienated from its sociocultural and historical components.

Finally, other authors argue that aura is defined by the significance we attribute to any kind of objects; in other words, it does not matter if it is an artefact exhibited in a museum, an original or a copy, and a physical or a digital object. MacIntyre et al. (2004), for example, defined the aura of an object or place as “the combination of its cultural and personal significance for a user or group of users” (p. 37). Similarly, Coleman (2014, para. 10) states that one attributes aura to any object that they have an emotional resonance with.

On the basis of the aforementioned studies, we identified 10 elements that are key for the experience of aura and authenticity in museum artefacts (Table 1). These 10 elements allowed us to translate the experience of aura and authenticity into simpler concepts and, thus, to examine among non-experts what triggered and/or hindered their experience of these while interacting with 3D models. Although the framework could have included more elements, some of them were grouped or omitted so as to be able to better utilise them in our mixed-method approach and make the adaptation of the framework for future studies easier. For example, “engagement” is explicitly mentioned by Kenderdine and Yip (2018) as essential to evoke aura. Latham (2013), on the other hand, does not use the term but discusses the relationship between

Table 1: The ten elements of aura and authenticity

	Elements	Meaning	Relevant studies
Authenticity	Rarity	The object is perceived as a rare, unique artefact	Hampp and Schwan (2014a, 2014b)
	Functionality	The original function of the artefact can still be perceived	Hampp and Schwan (2014a, 2014b)
	Creation process	The process of recording/modelling heritage artefacts and sites creates a bond among the artefact/site, people, and places that mediate the experience of authenticity	Jeffrey (2015); Jones et al. (2017)
	Museum authority	The museum authority confers authenticity to an object	De Jong, (2018); Hampp and Schwan (2014a, 2014b)
	Museum context/ exhibition techniques	In a physical space, shelves, labels, corridors, the public, and neighbouring artefacts confer authenticity. In the digital, this may be performed by hyperlinks, text, related objects, multimedia, etc.	De Jong, (2018); Hampp and Schwan (2014a, 2014b)
Aura	Engagement	A deep concentration that prompts transportive and immersive exchanges between viewer and object	Cameron and Gatewood (2000, 2003); Kenderdine and Yip (2018); Latham (2013)
	Object's link with the past	The digital object makes people feel as imagining or living the past	Hampp and Schwan (2014a, 2014b); Latham (2013)
	Connections bigger than self	The feeling of awe or reverence	Cameron and Gatewood (2000, 2003); De Jong, (2018); Hampp and Schwan (2014a, 2014b); Latham (2013)
	Personal resonance	The object triggers particular feelings, emotions, or memories	Coleman (2014); De Jong, (2018); Latham (2013); MacIntyre et al. (2004)
	Feeling of being transported	By exploring digital objects, users feel transported through time and space	Cameron and Gatewood (2000, 2003); Latham (2013); Kenderdine and Yip (2018)

the artefact and the observer. Since both studies describe similar effects on the observers, their ideas were grouped together under the element “engagement.” Similarly, Jeffrey’s “chain of proximity” (2015, p. 147) was not included as an individual element of the framework since it is not only an overarching analytical concept but also aligns with the element “creation process.” Table 1 presents these 10 elements along with their meaning and the studies from which we have drawn these concepts.

4 Methodology

To assess the effectiveness of our exploratory framework, we devised a mixed-method approach that combined an online survey and qualitative interviews to capture participants’ interaction and overall experiences with two 3D models selected for this study. The survey also provided a rich pool of potential interviewees, who were willing to further engage with the project and provide a more in-depth account of their experiences (Hesse-Biber, 2010, p. 465). As this research was carried out during the first wave of the pandemic, both the survey and interviews were conducted online. The researchers ensured participants’ privacy, anonymity, and confidentiality by asking for their consent and anonymising their responses.

Participants were asked about their interaction and experiences with 3D models of the Rosetta Stone (British Museum) and the Lewis Chess Pieces (National Museums Scotland), both available on Sketchfab. The Rosetta Stone (RS), found in 1799 during Napoleon Bonnaparte's Egyptian Campaign, was the key to decipher the Egyptian hieroglyphics, since its three scripts inscribed in three languages, i.e. Egyptian hieroglyphics, Egyptian Demotic, and Ancient Greek, have the same meaning. The Lewis Chess Pieces (LCP) are a set of 11 gaming pieces dated in the late twelfth–early thirteenth century, discovered in 1831 in the Scottish island of Lewis, Scotland, as part of a buried hoard that contained a total of 93 gaming pieces. Our main motivation for selecting the 3D models of these two objects was that they represent well the contrast between non-contextualised and deeply contextualized 3D models. More specifically, the RS is presented on *Sketchfab* (British Museum, 2017), in the profile of the *British Museum's channel* (British Museum, 2014), without any annotations and only with a short description (Figure 1). On the other hand, although the LCP was also uploaded on *Sketchfab* (NMS – National Museums Scotland, 2019), they have been embedded in the official website of the *National Museums Scotland* (NMS – National Museums Scotland, n.d.), accompanied by multimodal content, including text, videos, images, and a facts list, which describe the artefacts' historical background and context (Figure 2). Also, both digitisations are of high quality and belong to credible and prestigious institutions, while both objects are quite known to the

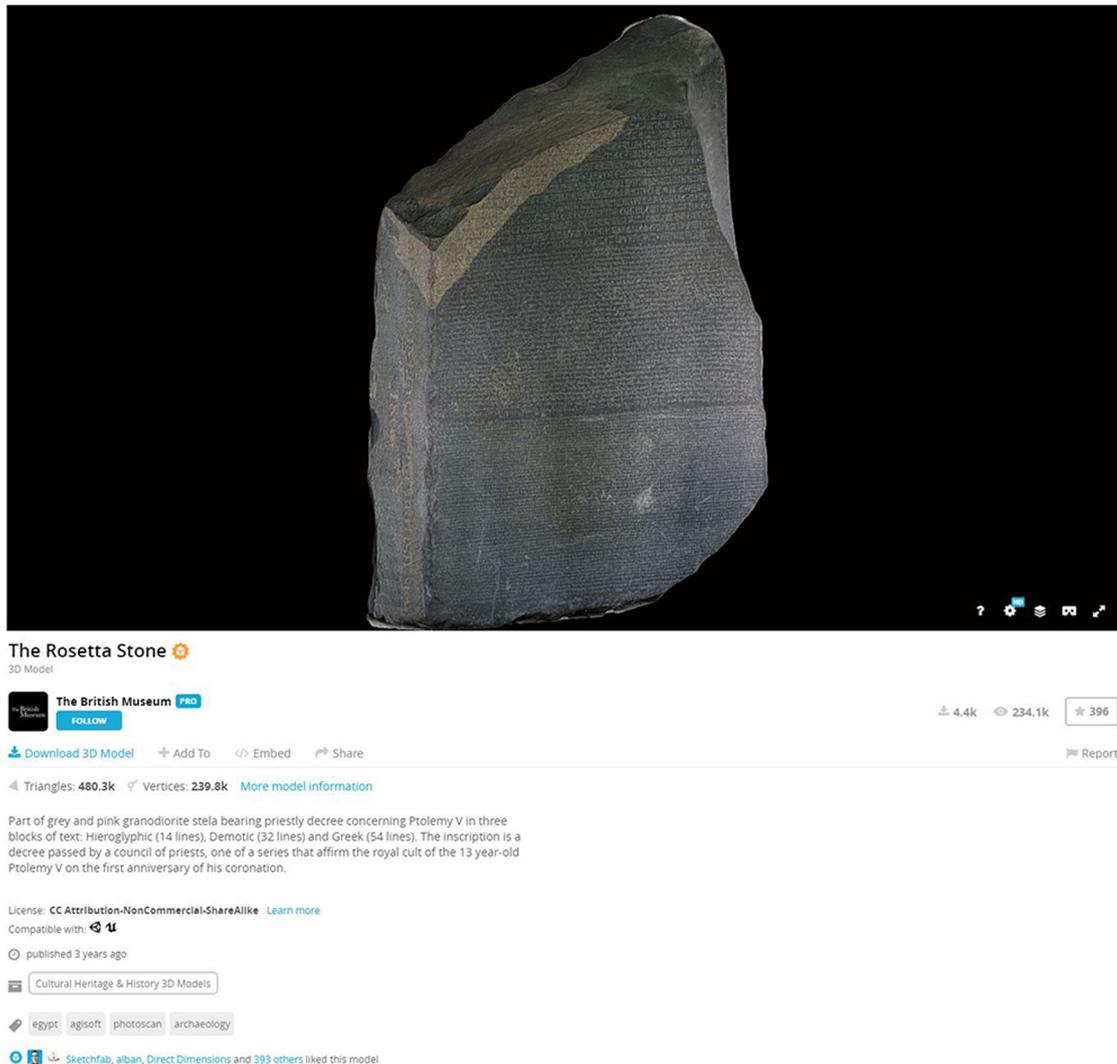


Figure 1: Screenshot of the Sketchfab webpage in which respondents explored the 3D model of the Rosetta Stone. <https://sketchfab.com/3d-models/the-rosetta-stone-1e03509704a3490e99a173e53b93e282>.

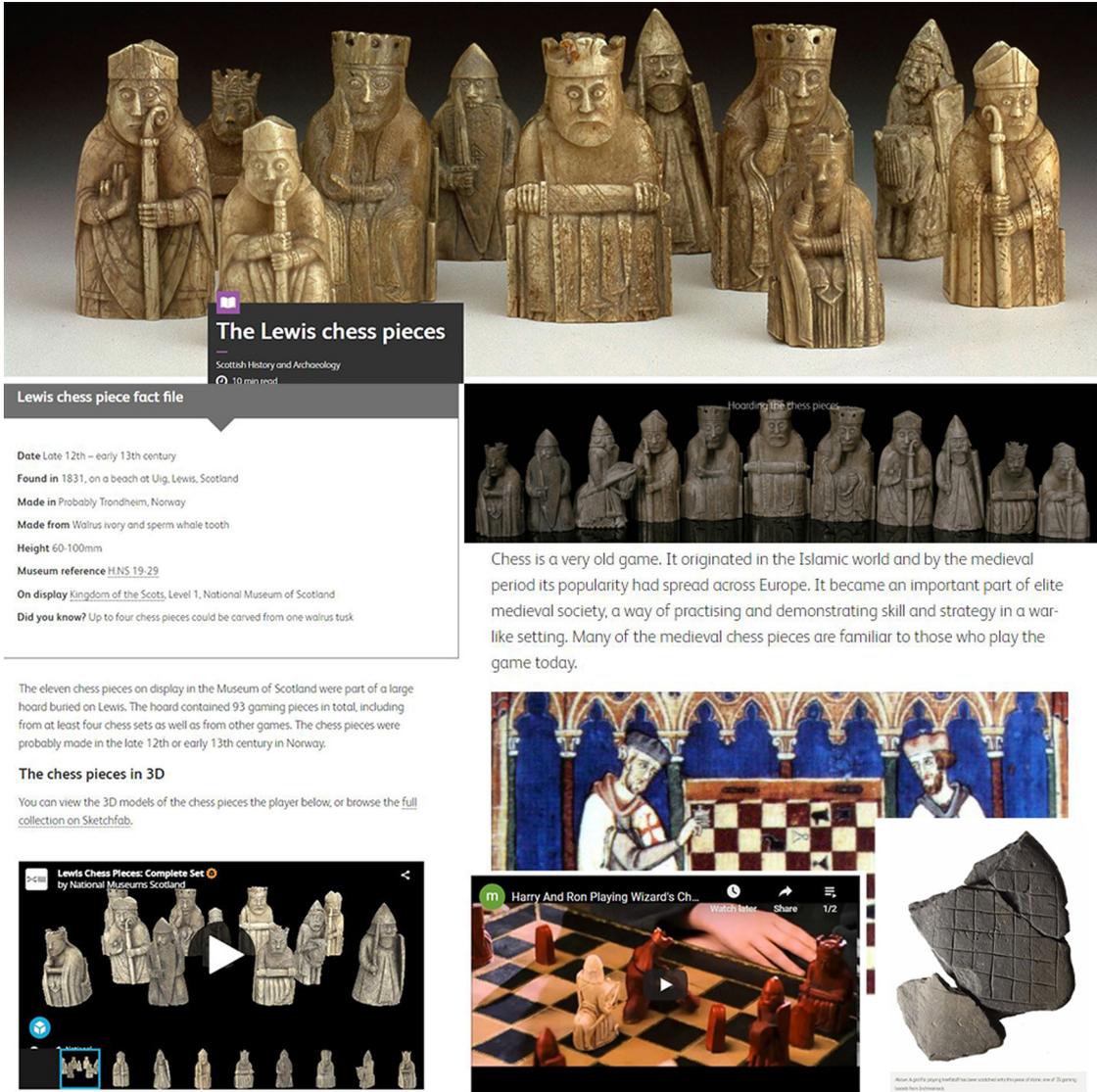


Figure 2: Screenshots of the National Museums Scotland’s webpage in which respondents explored the 3D models of Lewis Chess Pieces. <https://www.nms.ac.uk/explore-our-collections/stories/scottish-history-and-archaeology/lewis-chess-pieces/>.

general public; RS is one of the most well-known archaeological objects worldwide, while the LCP are recognisable not only because of the popularity of the board game but also because they were used in a scene in the Harry Potter film “The Sorcerer’s Stone.”

Once the artefacts were chosen, conducting an online survey was deemed to be the essential first step that could provide a substantial amount of quantitative data, also combined with some qualitative responses via open-ended questions. Given that respondents had to follow links to the 3D models and museums’ websites, as well as due to the pandemic that did not allow face-to-face interaction with research participants, a digital approach was a sufficient and responsible way to conduct this research. Respondents were reached via social media, including WhatsApp, Instagram, Twitter, and Facebook groups. The design of the survey paid particular attention to the phrasing and ordering of questions to avoid bias, providing clear instructions, and developing questions that were only relevant for this research (Evans & Mathur, 2018, p. 872; Ward, 2017, para. 22, 31). Also, to avoid drop-off respondents, the survey was kept “long enough to get the required information, but not so long as to affect response rates” (Evans & Mathur, 2018, p. 873). The fact that all 71 respondents answered all survey questions, indicates that the latter was achieved.

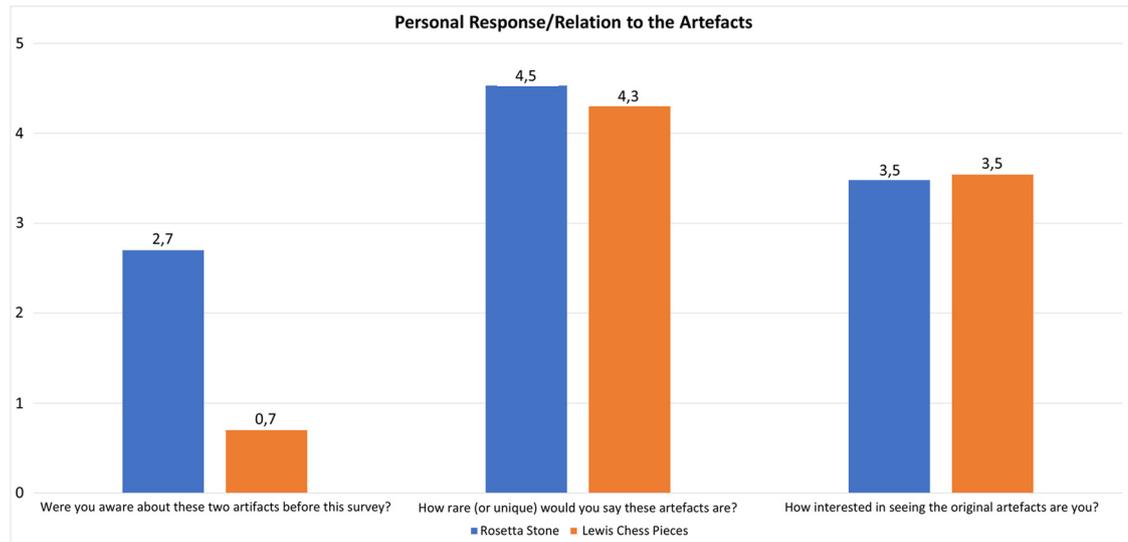


Figure 3: Column chart showing participants' personal response/relation to the artefacts.

The questionnaire, created in Google Forms, was divided into four sections, and included both open and close-ended questions, as well as Likert scale questions. It was designed to find whether and how the 10 elements of aura and authenticity were experienced in the 3D models. Since the comparison of participants' experiences with the two artefacts was essential for this research, questions for both 3D models were included in the same questionnaire. The first section covered the demographics of the respondents, including age, occupation, gender, and nationality. In the second section, respondents were asked about (a) their previous interaction/experience with 3D models and (b) their experience with/knowledge of each of the objects (Figure 3). The questions in the third and fourth sections were related to participants' experience of aura and authenticity in their interaction with the 3D models (Figures 4 and 5). As aura and authenticity are difficult to comprehend concepts, the two terms were not explicitly mentioned in the questions, but instead they were described using the 10 elements of the framework presented in the previous section (Table 1).

Finally, the survey was deployed not only to gather primary data but also to identify respondents who were more likely to provide in-depth explanations about their experiences. Hence, semi-structured

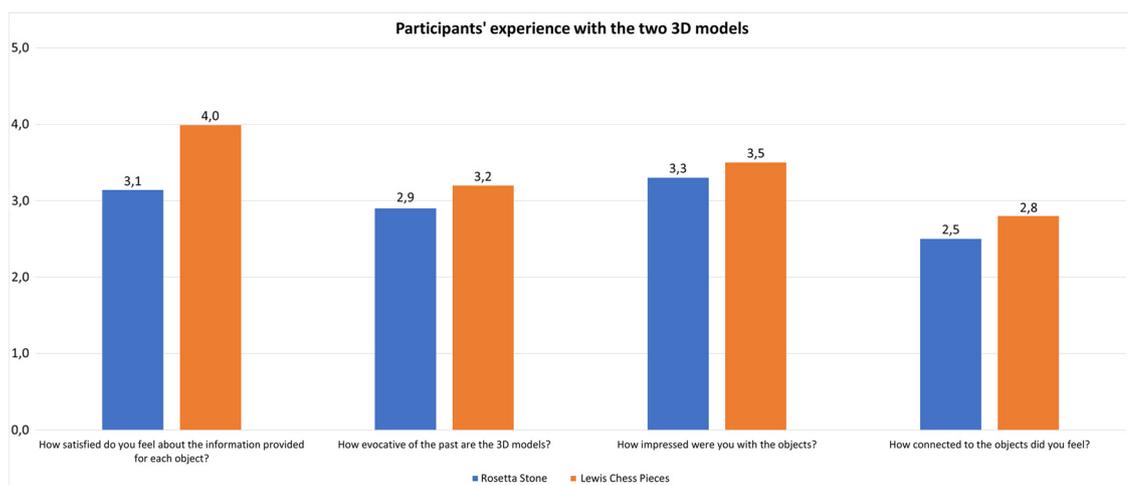


Figure 4: Column chart showing participants' experience with the two 3D models.

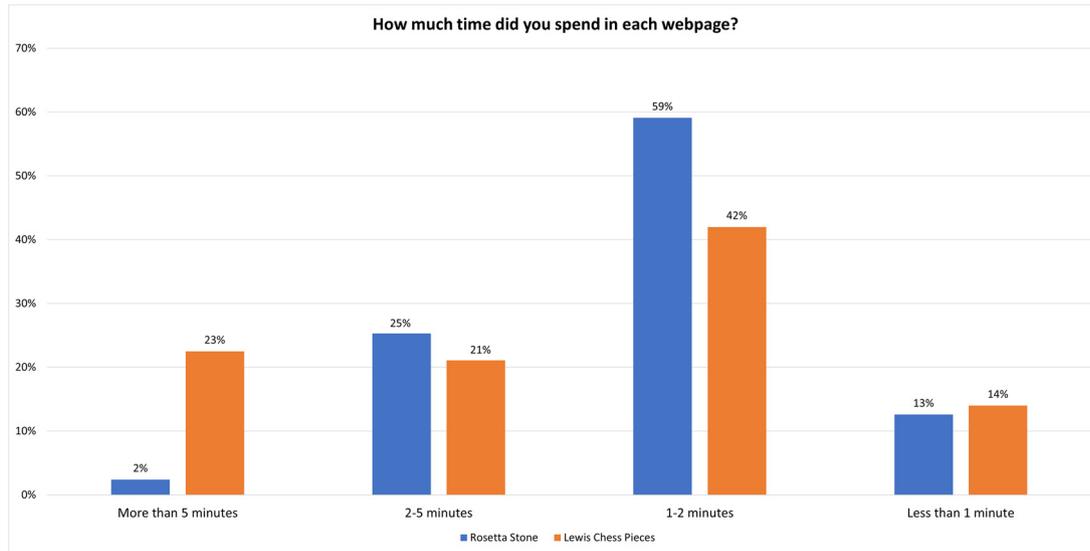


Figure 5: Column chart showing participants' responses to the question "How much time did you spend in each website."

qualitative interviews were conducted with selected survey respondents. Questions in the interviews were devised to delve deeper into users' perceptions, experiences, and interactions with the two models, and to better understand how specific aspects of their experiences affected their thoughts and feelings (Hesse-Biber, 2010, p. 455; Jensen & Laurie, 2016, p. 173; Weiss, 1994, p. 48). To enable the latter, probe questions in relation to certain answers they provided in the survey were asked. The collected data were thematically analysed, thus permitting the identification of four similar themes among different, individual experiences: contextualisation, interactivity physicality, and digitality.

5 Results and Discussion

5.1 Survey

The survey remained open for 10 days and collected 71 responses from 49 women, 21 men, and 1 who did not choose a gender identity. Most of them (62) were aged between 25 and 34 years, while almost half (32) were Brazilian. The latter was because of the network of one of the authors. It should be highlighted that although there were also teenagers and participants older than 65 years who responded to the survey, the participants in the 25–34 age group were the majority, thus not allowing us to reach safe conclusions about how other age groups may respond to 3D models. However, the geographic distribution of the respondents (20 nationalities) as well as their varying levels of education (from high school to doctorate) provided a diverse enough sample. The latter was amplified by the fact that of the 71 participants, only 10 respondents were aware of the Lewis Chess Pieces (LCP), while 38 had already heard about the Rosetta Stone (RS) (Figure 3). Also, two-thirds of our respondents (48) were not used to exploring 3D models.

According to the responses (Figures 3 and 4), 60 of the participants indicated that both 3D models were considered completely or quite trustworthy. The majority could perceive the rarity and uniqueness of the objects (LCP: 38, RS: 54) and feel a link to the past (LCP: 62, RS: 42). Also, most participants responded that they were impressed by the 3D models (LCP: 35, RS: 36). However, not all respondents felt connected to the artefacts: 37 for the RS and 21 for the LCP responded that they did not feel connected or only somewhat connected to them.

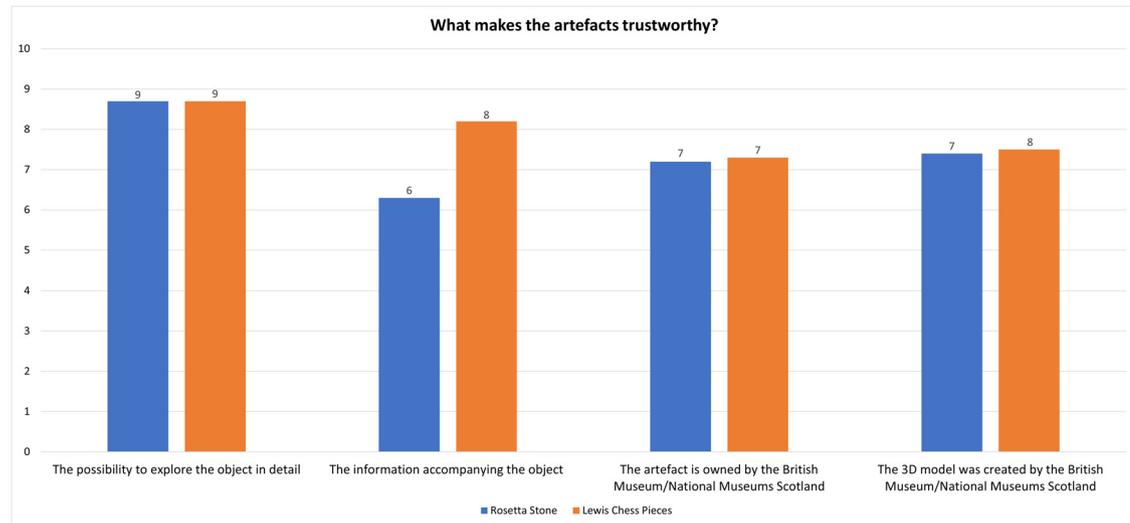


Figure 6: Column chart showing a comparison between the elements that make the Rosetta Stone and the Lewis Chess Pieces trustworthy.

Respondents showed a predilection for the LCP. Although only 20 spent more than 2 minutes exploring the RS, 31 spent 2 or more minutes with the LCP (Figure 5). Also, while only 34 responded that they were satisfied/extremely satisfied with the information provided for the RS, 56 argued the same for the LCP. Nevertheless, the majority of participants were interested in seeing the original artefacts: 40 for the RS and 39 for the LCP (Figure 3).

The most significant difference in the responses was about the aspects that contribute to making the objects trustworthy (Figure 6). While 55 participants strongly agreed that the information provided about the LCP makes them a trustworthy representation, only 29 said the same for the RS.

Besides, the responses collected via the open-ended questions indicated that an engaging experience with the artefacts, via information and interaction, could facilitate the auratic experience and make the objects trustworthy. Once respondents knew more about the artefacts' history and could digitally interact with them, they found it easier to relate to them. This feeling is well illustrated by the following response:

“Rosetta Stone: to me it is only a single object that is taken out of all the context and the brief text has done a poor job presenting the context for the object. I don't find anything relatable there. Lewis Chess Pieces: More background information is provided and I can get to know the history better. There are not only text(s) for explanation, but also photos which provide a visual presentation of the past.”

Responses also revealed that participants lacked the physicality of the experience. In addition, a few responses also indicated that the digital experience makes it harder to feel a link with the past:

“I knew I was exploring antiques, but the fact that I was looking at them through a computer screen avoided it from being an experience that made me think about the past.”

Participants' responses to the survey provided an initial indication that the lack of physicality and the digitality of the experience were barriers to the experience of aura and authenticity. This was clarified further through the qualitative interviews.

Finally, it is worth noting that no substantial generational difference was found in participant responses. In all age groups, as indicated in both the survey and the interviews, there were amazed and bored respondents; those who could feel connected to the artefacts and those who could not; as well, those who liked very much to interact with the digitised objects and those who thought that the online experience is not as exciting as a physical visit to a museum.

5.2 Qualitative Interviews

Eight interviews with selected survey participants allowed a deeper reflection on how the interaction with the 3D artefacts, their contextualisation, and users' affective responses were essential to experience aura and authenticity. When better understanding the objects' historical background and closely examining their details, interviewees felt closer to the artefacts, feeling connected to them and trusting that they were reliable reproductions. Because of that, respondents preferred exploring the LCP as they were better contextualised and easier to navigate and examine. It was also evident that interviewees highly missed the museum atmosphere in their experiences. In addition, they noted that the "digital nature" of the experience prevented them from feeling a stronger connection with the objects. In that way, they felt that the digital was more of an obstacle than an aid in their experience. Based on the aforementioned, the responses to the interview questions were analysed based on four themes: contextualisation, interactivity, physicality, and digitality.

5.2.1 Contextualisation

Contextualisation was a key to ensure and/or facilitate all of the 10 elements of aura and authenticity. It was through the contextual information that users could perceive the objects' rareness/uniqueness, as well as their original function. Detailed information allowed interviewees to activate personal memories and to feel the link with the past.

"I think they come together, the information and the connection. I feel like if I know the background, the historical and cultural background of the object, and if I know some information about it, I feel more connected to the object. (...) [K]nowing all this interesting information, it makes my connection to the 3D models more...magical, let's say." (Interviewee 5)

This was reinforced by a comparison of the 3D models. When talking about their experience with the LCP, interviewees highlighted the rich multimodal content and found the detailed information about the object as highly satisfactory. On the other hand, in the case of the RS, interviewees argued that because of the limited contextualisation, the experience of some elements of aura and authenticity, such as the link with the past, was hindered:

"I would like to see more precise information about how it was used. It is like... Where exactly was it? In the middle of a square, in the streets, or inside a room? I think that was a thing that they should explain in the texts." (Interviewee 2)

Our findings align with the previous research that highlights the importance of providing compelling and effective contextualisation for digital objects (De Jong, 2018; Linaza et al., 2014; Lloyd, 2016; Statham, 2019). Respondents particularly emphasised annotation as a means to provide information in a straightforward way attached to specific parts of the objects. This is in line with what is argued by Abbott, Bale, Gowigati, Pritchard, and Chapman (2011), who discuss how annotations can enhance public engagement with 3D models and better communicate the artefacts' context and interpretation. We also agree with Hindmarch et al. (2019), who argue that contextualisation is essential for digital objects to evoke aura, but we also believe that other aspects, such as interactivity, act in addition to it to confer aura to digital objects.

5.2.2 Interactivity

Interactivity was also crucial to experience aura and authenticity. Interviewees were deeply engaged with the artefacts while manipulating them: they enjoyed the possibility to rotate the objects, zooming in and out, and examining their details as they please, being able to see their geometry, colours, and texture. When reporting this, interviewees described their experience as if they were transported to somewhere else, either feeling as if they were in direct contact with the artefacts (somewhere between the physical and the digital

spectrum) or as if they were transported back to their personal memories, for example, when they physically saw the Rosetta Stone or when they played chess.

“The chess pieces took me right to those moments in which I moved such pieces on the board, when I played chess... It really evokes me that... It is like I was handling the piece at that very moment, it is so realistic.” (Interviewee 6)

It was because of this very interaction with the objects that interviewees felt closer to the artefacts. All interviewees showed excitement while noticing that they were doing more than what is possible to do in a physical visit to a museum.

“So sometimes even if I visit a physical museum...and even if I am interested in physical objects sometimes, I’m not so satisfied. I don’t feel the connection with the object because I can’t zoom, I can’t even touch it. And by rotating and by zooming the 3D model, it’s like... I feel like I can do more. I can touch, let’s say... I don’t touch, but you know, I feel more connected.” (Interviewee 5)

Also, participants could better understand the function of the object by interacting with the 3D models.

“...if you take some time to inspect something detailed, you kind of like, imagine how it was constructed...for the Rosetta stone, [you] imagine someone doing the job of hitting this stone to draw the inscriptions (...) Did they write it somewhere first? Did they write all the hieroglyphs part first, and then the other one, and then the other one? Or how was it?” (Interviewee 3)

“What came through to my mind while I was seeing the object was Edinburgh, to be honest. [...] So I imagined people playing chess, with all the Scottish costumes, in that very old Edinburgh downtown, the Royal Mile...” (Interviewee 7)

Besides, the interviewees highlighted that it was the manipulation of and interaction with the artefacts that made them look impressive.

“I did not know I could explore museum objects in such a detail, zooming in, out, rotating them... I was impressed about how precise and how detailed those 3D models can be. I was amazed about how technology is advanced... I mean, I did not know we have the possibility to visualize and explore objects with so much detail...we can see even the minor particularities of them. And it is so nice that we can do it even like thousands of kilometers away from that piece.” (Interviewee 8)

By interacting with the objects, the feeling of elements of aura and authenticity was facilitated: functionality, feeling of being transported, link with the past, and evocation of memories. Hence, this research confirms the importance of interactivity in 3D models as also argued by Di Giuseppantonio Di Franco, Camporesi, Galeazzi, and Kallmann (2015). The manipulation of the (digital) objects – typically prohibited in museums – allowed participants to examine their minute details and, thus, learn more about their materiality. Because of the latter, participants found that the trustworthiness of the 3D models was amplified. Such responses also support the argument that 3D models enable corporeal and affective experiences (Papadopoulos et al., 2019) as well as a sense of virtual tactility (Di Giuseppantonio Di Franco et al., 2018).

5.2.3 Physicality

Even though interviewees felt engaged with and impressed by the 3D models, they also reported the absence of physicality in their experience. They highly missed the physical context, including the museum atmosphere, rooms, and corridors, as well as neighbouring artefacts. The presence of other visitors and the company of relatives and friends were also missed. Often, this feeling was expressed together with the regret that the experience “is not the same” as visiting a museum and seeing the real object:

“You cannot have everything you have in a museum room, the people, the walls, inscriptions, banners, whatever... So it is nice, you can do many things with the object, but at the same time you don’t have let’s say...the atmosphere of the museum.” (Interviewee 4)

Interestingly, three interviewees also remarked that they missed not only the museum itself but also the whole process of going to a museum, including even the transportation to reach the institution. In other words, the social aspect of museum visits (Falk & Dierking, 2016; Grüner et al., 2019, p. 2; Vayanou et al., 2020) was highly missed, which in turn affected most of the elements of aura and authenticity. It is quite likely that such responses, which also emphasised the importance of making available digital representations of museum artefacts, also reflect the influence of physical and social isolation during the pandemic.

5.2.4 Digitality

While it is true that interviewees enjoyed exploring the 3D models, they all expressed a general feeling that it was harder to feel connected to a digital object. They felt “distant” to the objects, arguing that their digitality took away the possibility to feel a link with them. As a result, the digital nature of their experience was presented as an obstacle to feeling a connection with the objects:

“I think it makes it less personal. Being in front of a computer screen... It’s a whole new world inside the computer screen... So there’s a lot you can do, and that’s amazing, but it still takes away this feeling of connection that you get...when you connect with someone or with an art piece.” (Interviewee 1)

Interestingly, three interviewees described moments in which they were feeling close to the objects, almost touching them, but then, they felt “taken back to reality” because of technical issues:

“Because when you’re experiencing the 3D models, you feel like [you] lose the reality with the virtual. You are in the middle, let’s say [...]. But when there is a moment when you have errors like these, it is like you go back to reality! And then you see like: the errors are there, in the digital. And I am here, in the chair.” (Interviewee 5)

It becomes evident from the aforementioned responses that the remediation of the physical into a digital form is a double-edged sword. While the digital is essential to engage, prompt connections, and make users feel transported, at the same time, it can also hinder the experience and break these connections. Once the artefacts are remediated, they are explored via technological devices, and thus, technology is the mediator of our experience with the heritage artefacts. According to the technological mediation theory (Verbeek, 2015), when technology acts as a mediator between people and the world, it shapes the way we perceive and act in the environment around us. In other words, by visualising the artefacts with the help of technology, our experience with them may also be altered: technology changes the way we see and how we look at the artefacts (Moens, 2018).

5.3 The Experience of the Ten Elements

Based on participants’ responses, it became clear that seven of the ten elements of aura and authenticity were experienced in the 3D models. Rarity, functionality, creation process, museum authority, engagement, personal resonance, and feeling of being transported were almost completely experienced. On the other hand, two elements, namely, the objects’ links with the past and the museum context/exhibition techniques were not felt by all respondents; the latter is understandable since 3D models cannot effectively capture and/or remediate the museum atmosphere. Only 1 of the 10 elements, i.e. the connections bigger than self, appeared to be remediated less effectively since participants expressed to a lesser extent the feeling of awe or reverence for the two objects. However, as noted earlier, it was technology itself (and most respondents’ unfamiliarity with it), including the ability to closely interact with and manipulate the artefacts, that made them look impressive (or enhanced their impressiveness).

This research highlighted four aspects that are critical when discussing aura and authenticity in 3D objects: on the one hand, contextualisation and interactivity, and on the other hand, the physicality (or lack thereof) and the digitality of the experience. More specifically, objects’ materiality was highly missed by

users and the digital nature of the experience often prevented them from experiencing aura and authenticity. However, it became evident that a combination of interactivity and contextualisation can compensate for the “weirdness of the digital” (Jeffrey, 2015). The findings suggest that contextualisation and interactivity are essential to engage, immerse, and inform users about the objects, thus enabling them to experience many of the aforementioned ten elements.

The comparison between the experience with the 3D model of the RS and those of the LCP made clear that because the latter provide a better contextualisation and are of better quality (in terms of 3D resolution), users were not only more pleased with their experience but also thought that they were more impressive, trustworthy, and evocative. Besides, users spent more time exploring the LCP and could relate more to these, even though the RS was more familiar to them.

5.4 Aura and Authenticity: A Social Construction

Besides showing how to examine and assess aura and authenticity via the proposed framework, this research also demonstrates that the two concepts, rather than being rooted in the materiality of the original objects, are socially constructed and negotiated. Responses showed evidence of aura migration to the digital objects (Jeffrey, 2015; Latour & Lowe, 2011), when, for example, participants felt that they were interacting with rare and unique objects, through which they could recall memories and feel transported to liminal places, between the physical and the digital.

Also, many respondents reported that they felt a link with the past, even though some claimed that it could be stronger if they were facing the original artefact. Hence, we agree with Jeffrey’s (2015) argument that although the 3D models’ lack of location, degradation, and substance weaken the link with the past, and ultimately, the chain of proximity can break, it is also possible – under certain conditions – to spark the link with the past. Therefore, the findings of this research are more akin to Garstki’s (2016) argument that, when experiencing a digital heritage artefact, our relationship with the past is somewhat impacted because of the digitality, but it is not completely broken.

This study also defends the idea that aura is related to the social or personal value given to an object – in that case, a digital object. MacIntyre et al. argue that the aura of an object is “the combination of its cultural and personal significance for a user or group of users” (2004, p. 37). It is possible to say that some respondents admired the 3D model of the RS while having in mind the original artefact’s significance for the world. The same is valid when taking into account Coleman’s argument that one attributes aura to any object they have an emotional resonance with (2014, para. 10). Since some respondents already had a memory related to the RS or to the LCP, for example, when playing chess, seeing the Harry Potter movie, or visiting the actual artefacts, the 3D models triggered that connection.

Another highly felt element is the museum’s authority to confer authenticity to reproductions: the museum’s website and/or profile in Sketchfab contributed to making the 3D models trustworthy. This confirms museums’ power to vest an object with authenticity (De Jong, 2018; Hampp & Schwan, 2014a, 2014b), even in the digital realm. Participants’ trust in the 3D objects was also amplified by their belief that they were created by skilled professionals; this reinforces the argument that the creation process can confer authenticity to digital reproductions (Jeffrey, 2015, 2018; Jones et al., 2017). This also highlights the importance of being transparent in the creation process by making clear who and how created the 3D models.

Finally, findings also demonstrated that, instead of diminishing the aura of the originals, as argued by Benjamin (1968/2007), the 3D models acted the other way around. After their experience with 3D models, the majority of respondents were interested in seeing the original artefacts; this includes those who had never heard about the objects. Besides, participants also seemed curious and interested in knowing more about the objects and their history. This endorses the idea that reproductions, rather than diminishing the importance of the originals, trigger and make us feel aware and curious (Latour & Lowe, 2011; MacCannell, 1976; Walsh, 2007).

Altogether, it is arguable that, once all these elements could be perceived, the 3D models were endowed with authenticity and aura – albeit they evidently are not the original artefacts. Even though 3D objects have no location, no substance, and do not degrade, they are still seen as authentic objects, which can evoke memories and create personal connections. These arguments reinforce a constructivist view for aura and authenticity. Nevertheless, we do not argue that a materialist view should be discarded, especially because one of the elements related to aura – connections bigger than self – seems to be intrinsically related to the materiality of the artefacts. In their experience with the 3D models, most respondents did not feel awe with the grandiosity of the historical artefacts. The lack of substance and of some of their three-dimensional properties, for example size and weight, appeared to be crucial for that. Also, the feeling of physically being in the museum appears to be essential for feeling in awe. This, reinforces a particular point of Benjamin's arguments: that only the original artefact causes the effect of awe (1968/2007).

Digital objects have their own way to emanate aura and authenticity – one that is different from that of the physical objects. While it is possible to argue that aura and authenticity in physical artefacts are highly related to their physicality and the museum context, in 3D models, they are highly connected to contextualisation, interactivity, and high-quality reproductions. Thus, we echo Cameron's argument that digital objects have their own kind of aura and authenticity (2007), especially considering the way that 3D models impress users. Furthermore, this research is in line with Garstki's argument (2016) that we should not aim to equate 3D models to physical, original objects. Those are different objects, with different characteristics, that cause different effects on the viewers. Because of that, we ought to also highlight that 3D models cannot stand in for the originals (Rabinowitz, 2015); they may evoke the originals but would never be able to simply substitute them.

6 Conclusion

This article has presented a framework that allows the investigation of whether aura and authenticity can be experienced on 3D representations of heritage artefacts, while utilising a user study to demonstrate how the 10 elements of aura and authenticity can be evaluated. Our findings demonstrate that despite the lack of physicality, which was highly missed by the participants in this study, interactivity, multimodality, and contextualisation enable users to experience aura and authenticity and develop affective experiences. Annotations seem to be a powerful method that has the potential to provide users of digital collections with enriching information. In addition, presenting 3D models in museums' official websites – instead of only in 3D repositories – make the 3D representations appear not only more reliable but also more effective, since they are also embedded in a digital environment in which they can be better contextualised.

For this study, we collated and compared diverse ideas to suggest a framework that breaks down aura and authenticity into 10 elements. It should be noted, however, that despite the mixed-methods approach, the substantial survey sample, and the rich descriptions obtained through the interviews, we see the results of this research as a demonstration of the efficacy of the proposed framework rather than as an approach that should be adopted as is. We acknowledge that the 10 selected elements may not entirely encompass what aura and authenticity are, especially given the diverse discourse around these two concepts in different fields. This framework has been mostly based on literature around heritage and therefore has not considered research in other fields, for example game studies, in which far more complex issues would have to be considered, including edutainment, the affordances of virtual worlds, historical accuracy, artistic license, and photorealism, among many others (see, e.g. Chapman, 2016; Elliott, 2017; Mochocki, 2021; Politopoulos, Mol, Boom, & Ariese, 2019; Reinhard, 2018). Most importantly we acknowledge a potential criticism of our attempt to assess what appears to be not assessable due to the abstract and elusive nature of the two concepts. Despite these limitations, the present study has shown that the proposed framework can be effective in enabling the examination of the presence or the absence of various elements that have been proposed as integral in experiencing aura and authenticity, while also having the potential to be expanded or adapted for different research fields and applications.

Although this framework was devised for digitised artefacts, we advocate that it could be equally applied to other kinds of reproductions, including computer graphic reconstructions. We also believe that it could be applied – and, if needed, adapted for – other cases, including not only fine art but also physical artefacts, being replicas or originals. Similar studies could also explore the migration of the aura from the 3D representation to the original. Although the survey participants' response that they would be interested in seeing the original artefact after experiencing the 3D model (Figure 3) may indicate such a migration, this was out of the scope of this research and thus was not explored further. Finally, follow-on studies on aura and authenticity in 3D representations should also consider 3D printouts of heritage artefacts as they have become increasingly common in heritage contexts (also see Cronin, 2015; Younan & Treadaway, 2015).

The COVID-19 pandemic found many institutions unprepared to make the digital transition. Museums that had already invested in the digitisation of their collections or the development of other digital engagements with their audiences managed to respond to the urgent need for cultural interactions, while others faced the consequences of the long-term devaluation of cultural heritage and of the challenges and inequalities that digitalisation has brought about. Although we did not experience a 3D digitisation rush, mostly because of the investment required in terms of time, skills, and money, it is without a doubt that the pandemic has changed our expectations and the ways we (will) interact with cultural heritage institutions and their collections. Pre-pandemic, we often experienced the mass 3D digitisation of heritage artefacts as a means of preservation. Even though the lessons learnt from the struggles of archiving and sustaining other types of digital scholarship have made clear that these two notions cannot be seen hand in hand, the “wow factor” of the 3D models together with the simplicity of digitisation tools (including the recent integration of LiDAR technology in Apple devices) and the accessibility of online repositories (e.g. Sketchfab) has cultivated a technological fetishism that drives the production of 3D models without considering their potential uses, users, and afterlives.

The rethinking of digital interactions in museum and heritage contexts during the pandemic and the reevaluation of our responsibilities, priorities, and values in a post-pandemic world should take into account research that explores how people respond to the digital – either 3D or not – and how digitisations can be infused with meaning and value that go beyond the enchantment of the technology. We hope that the proposed framework that indicates what people value in three-dimensional representations of physical artefacts will provide a steppingstone that will enable museum professionals, digitisation experts, as well as 3D enthusiasts to rethink why three-dimensional representations are produced and how they can become meaningful for the intended audiences.

Finally, we would like to conclude this article with an invitation to other scholars to discuss what really constitutes aura and authenticity in heritage contexts. Discourses in cultural heritage typically use aura as an aesthetic category mostly based on Benjamin's article “The Work of Art in the Age of Mechanical Reproduction.” However, as many scholars argue (see, e.g. Costello, 2005; Hansen, 2008), the concept of aura needs to be explored by considering his earlier work as well as the different translations of his original work (Hansen, 2008, pp. 336–337), which highlight that aura is a historical category “something which art has or acquires only at a particular historical moment” (van den Akker, 2016). According to Benjamin's unpublished report in 1930 (as quoted in Hansen, 2008, p. 336), “Everything I said on the subject [the nature of aura] was directed polemically against the theosophists, whose inexperience and ignorance I find highly repugnant... First, genuine aura appears in all things, not just in certain kinds of things, as people imagine.” For Benjamin, the emphasis is placed on the fact that experience, memory, and perception wane (Costello, 2005, p. 165), which is incompatible with a purely aesthetic view of aura. Similarly, authenticity is also a historical category attributed to an artwork during particular historical moments and circumstances, “its inception, appreciation, the possible damages it suffered, its testimony and so on” (van den Akker, 2016, p. 46). Therefore, artworks obtain aura (and authenticity) when they become “a thing of the past” (p. 50) and have collected history through their existence. A “historicising gaze” as van den Akker (2016) puts it, is necessary to fully comprehend Benjamin's aura and authenticity; this is something that most of the work in our field is lacking and would be a welcomed addition to the existing discourses in 3D heritage.

Acknowledgments: We would like to thank the survey participants and interviewees for their valuable contribution to this research. We are also grateful to the two anonymous reviewers and editors of this

special issue who provided constructive feedback that helped us to improve the final version of the manuscript.

Conflict of interest: Authors state no conflict of interest.

References

- Abbott, D., Bale, K., Gowigati, R., Pritchard, D., & Chapman, P. (2011). Empire 3D: A collaborative semantic annotation tool for virtual environments. In H. R. Arabnia & L. Deligiannidis (Eds.), *MSV 2011: Proceedings of the 2011 International Conference on Modeling, Simulation & Visualization Methods, WORLDCOMP'11, July 18–21, 2011, Las Vegas, Nevada, USA* (pp. 121–128). Las Vegas, Nev.: CSREA.
- Benjamin, W. (1968/2007). The work of art in the age of mechanical reproduction. In H. Arendt (Ed.), *Illuminations* (pp. 217–252). New York: Schocken Books.
- BSMG – British Science Museum Group. (2020). Statue to drive away evil spirits. Retrieved from: <https://learning.sciencemuseumgroup.org.uk/resources/statue-to-drive-away-evil-spirits/>, Accessed 6 December 2020.
- British Museum. (2014). Official profile of the British Museum on Sketchfab. Retrieved from: <https://sketchfab.com/britishmuseum>, Accessed 6 December 2020.
- British Museum. (2017). Rosetta stone [3D model]. Retrieved from: <https://sketchfab.com/3d-models/the-rosetta-stone-1e03509704a3490e99a173e53b93e282>, Accessed 6 December 2020.
- Cameron, C., & Gatewood, J. (2000). Excursions into the un-remembered past: What people want from visits to historical sites. *The Public Historian*, 22, 107–127. doi: 10.2307/3379582.
- Cameron, C., & Gatewood, J. (2003). Seeking numinous experiences in the unremembered past. *Ethnology*, 42(1), 55–71. doi: 10.2307/3773809.
- Cameron, F. (2007). Beyond the cult of the replicant: Museums and historical digital objects – Traditional concerns, new discourses. In F. Cameron & S. Kenderdine (Eds.), *Theorizing digital heritage: A critical discourse* (pp. 49–75). Cambridge, MA: MIT Press.
- Chapman, A. (2016). *Digital games as history: How videogames represent the past and offer access to historical practice*. New York: Routledge.
- CIT – Cyprus Institute of Technology. (2020). Survey on quality in digitisation of tangible cultural heritage. Retrieved from: <https://web.cut.ac.cy/limesurvey/index.php/121155?lang=en>, Accessed 6 December 2020.
- Cloud Tour. (2020). The Invincible Wreck. Historic England and Pascoe Archaeology. Retrieved from: <https://www.cloudtour.tv/invincible/>, Accessed 6 December 2020.
- Coleman, A. D. (2014, December 18). Aura: There's an app for that. *MIT Technology Review*. Available at: <https://www.technologyreview.com/s/533556/auras-theres-an-app-for-that>, Accessed 6 December 2020.
- Costello, D. 2005. Aura, face, photography: Re-reading Benjamin today. In A. Benjamin (Ed.), *Walter Benjamin and Art* (pp. 164–184). London and New York: Continuum.
- Cronin, C. (2015). 3D printing: Cultural property as intellectual property. *The Columbia Journal of Law & The Arts*, 39(1), 1–40. doi: 10.7916/jla.v39i1.2093.
- De Jong, S. (2018). *The witness as object: Video testimony in memorial museums*. Oxford: Berghahn Books.
- Di Giuseppantonio Di Franco, P., Camporesi, C., Galeazzi, F., & Kallmann, M. (2015). 3D printing and immersive visualization for improved perception of ancient artifacts. *Presence: Teleoperators and Virtual Environments*, 24(3), 243–264.
- Di Giuseppantonio Di Franco, P., Galeazzi, F., & Vassallo, V. (2018). *Authenticity and cultural heritage in the age of 3D digital reproductions*. Cambridge: McDonald Institute for Archaeological Research. doi: 10.1162/PRES_a_00229.
- Douglas-Jones, R., Hughes, J. J., Jones, S., & Yarrow, T. (2016). Science, value and material decay in the conservation of historic environments. *Journal of Cultural Heritage*, 21, 823–833. doi: 10.1016/j.culher.2016.03.007.
- EUR-Lex – European Union Law. (2011). Commission recommendation of 27 October 2011 on the digitisation and online accessibility of cultural material and digital preservation. *Official journal of the European Union*, 283(43), 39–45. Retrieved from: <https://eur-lex.europa.eu/eli/reco/2011/711/oj>, Accessed 6 December 2020.
- EC – European Commission. (2020). Basic principles and tips for 3D digitisation of cultural heritage. Available at: <https://ec.europa.eu/digital-single-market/en/news/basic-principles-and-tips-3d-digitisation-cultural-heritage>, Accessed 6 December 2020.
- Elliott, A. (2017). Simulations and simulacra: History in video games. *Práticas da História Journal on Theory, Historiography and Uses of the Past*, 2017(5), 11–41. <http://www.praticasdahistoria.pt/en/issues/praticas-da-historia-no-5-2017/simulations-and-simulacra-history-in-video-games/>, Accessed 21 April 2021.
- Evans, J. R., & Mathur, A. (2018). The value of online surveys: A look back and a look ahead. *Internet Research*, 28(4), 854–887.
- Falk, J. H., & Dierking, L. D. (2016). *The museum experience revisited*. New York: Routledge.

- Foster, S. M., & Jones, S. (2019). The untold heritage value and significance of replicas. *Conservation and Management of Archaeological Sites*, 21(1), 1–24. doi: 10.1080/13505033.2019.1588008.
- Garstki, K. (2016). Virtual representation: The production of 3D digital artefacts. *Journal of Archaeological Theory and Method*, 24, 726–750. doi: 10.1007/s10816-016-9285-z.
- Grüner, S., Specker, E., & Leder, H. (2019). Effects of context and genuineness in the experience of art. *Empirical Studies of the Arts*, 37(2), 138–152. doi: 10.1177/0276237418822896.
- Hagmann, D. (2018). Reflections on the use of social networking sites as an interactive tool for data dissemination in digital archaeology. *Interdisciplinaria Archaeologica*, 9(1), 7–20. doi: 10.17613/M6V56W.
- Hampp, C., & Schwan, S. (2014a). The role of authentic objects in museums of the history of science and technology: Findings from a visitor study. *International Journal of Science Education. Part B: Communication and Public Engagement*, 5(2), 161–181. doi: 10.1080/21548455.2013.875238.
- Hampp, C., & Schwan, S. (2014b). Perception and evaluation of authentic objects: Findings from a visitor study. *Museum Management and Curatorship*, 29(4), 349–367. doi: 10.1080/09647775.2014.938416.
- Hansen, M. B. (2008). Benjamin's aura. *Critical Inquiry*, 34(2), 336–375. doi: 10.1086/529060.
- Hesse-Biber, S. (2010). Qualitative approaches to mixed methods practice. *Qualitative inquiry*, 16(6), 455–468. doi: 10.1177/1077800410364611.
- Hindmarch, J., Terras, M., & Robson, S. (2019). On virtual auras: The cultural heritage object in the age of 3D digital reproduction. In H. Lewi, W. Smith, D. vom Lehn, & S. Cooke (Eds.), *The Routledge international handbook of new digital practices in galleries, libraries, archives, museums and heritage sites*. New York: Routledge.
- Holtorf, C. (2013). On pastness: A reconsideration of materiality in archaeological object authenticity. *Anthropological Quarterly*, 86(2), 427–443. www.jstor.org/stable/41857332
- ICOM – International Council of Museums. (2020). Museums, museum professionals and COVID-19. Available at: <https://icom.museum/wp-content/uploads/2020/05/Report-Museums-and-COVID-19.pdf>, Accessed 1 October 2020.
- Jeffrey, S. (2015). Challenging heritage visualisation: Beauty, aura and democratisation. *Open Archaeology*, 1(1), 144–152. doi: 10.1515/opar-2015-0008.
- Jeffrey, S. (2018). Digital heritage objects, authorship, ownership and engagement. In P. Di Giuseppantonio Di Franco, F. Galeazzi, & V. Vassallo (Eds.), *Authenticity and cultural heritage in the age of 3D digital reproductions*. Cambridge: McDonald Institute for Archaeological Research. doi: 10.17863/CAM.27037.
- Jeffrey, S., Hale, A., Jones, C., Jones, S., & Maxwell, M. (2015). The ACCORD project: Archaeological community co-production of research resources. In F. Giligny, F. Djindjian, L. Costa, P. Moscati & S. Robert (Eds.), *42nd Annual conference on computer applications and quantitative methods in archaeology, CAA2014* (pp. 289–295). Oxford: Archaeopress. <http://hdl.handle.net/1893/23882>
- Jensen, E., & Laurie, C. (2016). *Doing real research: A practical guide to social research*. London: Sage.
- Jones, S., Jeffrey, S., Maxwell, M., Hale, A., & Jones, C. (2017). 3D heritage visualisation and the negotiation of authenticity: The ACCORD project. *International Journal of Heritage Studies*, 24(4), 333–353. doi: 10.1080/13527258.2017.1378905.
- Kenderdine, S., & Yip, A. (2018). The proliferation of aura: Facsimiles, authenticity and digital objects. In K. Drotner, V. Dziekan, R. Parry, & K. C. Schröder (Eds.), *The Routledge handbook of museums, media and communication* (pp. 274–289). London: Routledge. doi: 10.4324/9781315560168.
- Latham, F. K. (2013). Numinous experiences with museum objects. *Visitor Studies*, 16(1), 3–20. doi: 10.1080/10645578.2013.767728.
- Latour, B., & Lowe, A. (2011). The migration of the Aura, or how to explore the original through its facsimiles. In T. Bartscherer & R. Coover (Eds.), *Switching codes: Thinking through digital technology in the humanities and the arts* (pp. 275–398). Chicago: University of Chicago Press.
- Linaza, M. T., Juaristi, M., & Garcia, A. (2014). Reusing multimedia content for the creation of interactive experiences in cultural institutions. In M. Ioannides & E. Quak (Eds.), *3D research challenges in cultural heritage* (pp. 104–118). Berlin: Springer. doi: 10.1007/978-3-662-44630-0_8.
- Lloyd, J. (2016). Contextualizing 3D cultural heritage. In: M. Ioannides, et al. (Eds.), *Digital heritage – progress in cultural heritage: Documentation, preservation, and protection* (pp. 859–868). Cham: Springer. doi: 10.1007/978-3-319-48496-9_69.
- Louvre. (2020). Petite Galerie – Visite Virtuelle. Retrieved from: <https://petitegalerie.louvre.fr/visite-virtuelle/saison5>, Accessed 6 December 2020.
- MacCannell, D. (1976). *The tourist: A new theory of the leisure class*. New York: Schocken Books.
- MacIntyre, B., Bolter, J. D., & Gandy, M. (2004). Presence and the aura of meaningful places. *Presence: Teleoperators and Virtual Environments*, 6(2), 36–43.
- Mochocki, M. (2021). Heritage sites and video games: Questions of authenticity and immersion. *Games and Culture*. doi: 10.1177/15554120211005369.
- Moens, B. G. (2018). Aesthetic experience in virtual museums: A postphenomenological perspective. *Studies in Digital Heritage*, 2(1), 68–79. doi: 10.14434/sdh.v2i1.24468.

- NEMO – Network of European Museums Organisation. (2020, April 7). Survey on the Impact of the COVID-19 situation on museums in Europe – Final report. Retrieved from: https://www.ne-mo.org/fileadmin/Dateien/public/NEMO_documents/NEMO_COVID19_Report_12.05.2020.pdf, Accessed 6 December 2020.
- NMS – National Museums Scotland. (2019). Lewis Chess pieces: Complete set. Retrieved from: <https://sketchfab.com/3d-models/lewis-chess-pieces-complete-set-d279ce3fd0e44726a21286877c367a05>, Accessed 6 December 2020.
- NMS – National Museums Scotland. (2020). Coffins and mummy masks. Retrieved from: <https://www.nms.ac.uk/explore-our-collections/stories/world-cultures/ancient-egyptian-collection/ancient-egyptian-collection/coffins-and-mummy-masks/>
- NMS – National Museums Scotland. (n.d.). The Lewis chess pieces. Retrieved from: <https://www.nms.ac.uk/explore-our-collections/stories/scottish-history-and-archaeology/lewis-chess-pieces>, Accessed 6 December 2020.
- ORNCG – Old Royal Naval College Greenwich. (2020). The painted hall at ORNC interactive 360° virtual tour. Retrieved from: <https://virtualltour.ornc.org>, Accessed 6 December 2020.
- Papadopoulos, C., Hamilakis, Y., Kyparissi-Apostolika, N., & Díaz-Guardamino, M. (2019). Digital sensoriality: The Neolithic Figurines from Koutroulou Magoula, Greece. *Cambridge Archaeological Journal*, 29(4), 625–652. doi: 10.1017/S0959774319000271.
- Politopoulos, A., Mol, A., Boom, K., & Ariese, C. (2019). “History is our playground”: Action and authenticity in Assassin’s Creed: Odyssey. *Advances in Archaeological Practice*, 7(3), 317–323. doi: 10.1017/aap.2019.30.
- Rabinowitz, A. (2015). The work of archaeology in the age of digital surrogacy. In B. Olson & W. Caraher (Eds.), *Visions of substance: 3D imaging in Mediterranean archaeology* (pp. 27–42). Grand Forks, ND: The Digital Press at the University of North Dakota.
- Reinhard, A. (2018). *Archaeogaming: An introduction to archaeology in and of video games*. New York: Berghahn Books.
- Rochlitz, R. (1996). *The disenchantment of art: The philosophy of Walter Benjamin*. New York: Guilford Press.
- SMZB – Staatliche Museen zu Berlin. (2020). 3D-Exhibition ‘Near Life.’ Retrieved from: <https://sketchfab.com/3d-models/3d-exhibition-near-life-82df261f24bd496382be73c2c7357498>, Accessed 6 December 2020.
- Statham, N. (2019). Scientific rigour of online platforms for 3D visualization of heritage. *Virtual Archaeology Review*, 10(20), 1–16. doi: 10.4995/var.2019.9715.
- UNESCO. (2020). Museums around the world in the face of COVID-19. Retrieved from: <https://unesdoc.unesco.org/ark:/48223/pf0000373530>, Accessed 11 June 2020.
- Vayanou, M., Katifori, A., Chrysanthi, A., & Antoniou, A. (2020). Cultural Heritage and Social Experiences in the Times of COVID 19. In *Proceedings of the AVI²CH 2020 workshop on advanced visual interfaces and interactions in cultural heritage* (co-located with 2020 international conference on advanced visual interfaces-AVI 2020), September 29, Island of Ischia, Italy. Article (Vol. 2). New York, NY, USA: Association for Computing Machinery. <http://ceur-ws.org/Vol-2687/paper2.pdf>, Accessed 6 December 2020.
- van den Akker, C. (2016). Benjamin, the image and the end of history. *Journal of Aesthetics and Phenomenology*, 3(1), 43–54. doi: 10.1080/20539320.2016.1187851.
- Verbeek, P. P. (2015). Beyond interaction: A short introduction to mediation theory. *Interactions*, 22(3), 26–31. doi: 10.1145/2751314.
- VGM – Van Gogh Museum. (2020). 360 stories. Retrieved from: <https://360stories.com/amsterdam/place/van-gogh-museum>, Accessed 6 December 2020.
- Walsh, P. (2007). Rise and fall of the post-photographic museum: Technology and the transformation of art. In: F. Cameron & S. Kenderdine (Eds.), *Theorizing digital heritage: A critical discourse* (pp. 19–34). Cambridge, MA: MIT Press.
- Ward, C. (2017, July 31). How to run surveys that engage customers and enlighten you. *My Customer*. Available at: <https://www.mycustomer.com/experience/voice-of-the-customer/best-practices-for-designing-engaging-customer-surveys>, Accessed 30 April 2020.
- Weiss, R. S. (1994). *Learning from strangers: The art and method of qualitative interview studies*. New York: Free Press.
- Younan, S., & Treadaway, C. (2015). Digital 3D models of heritage artefacts: Towards a digital dream space. *Digital Applications in Archaeology and Cultural Heritage*, 2(4), 240–247. doi: 10.1016/j.daach.2015.11.001.