

VR and the Death of the Frame? Filmmaking in an Age of Immersive Technology

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Abstract

In light of immersive 360-degree and 3D capture technologies, which give the end-user retrospective control of the angle of viewing, the visual language of traditional filmmaking might appear fundamentally disrupted. This paper expands upon the relationship between film and virtual reality (VR) in the context of heritage interpretation. It explores the continuity between the two media, but also the disparate conventions and traditions that they draw upon. If we acknowledge that no medium is transparent then we must also consider how the practitioner's tools and decision-making affect media content and its meaning. While in VR these decisions are more likely to define the ways in which the audience can interact with content, in film the composition of the frame plays a significant role in channeling the audience's attention in a predetermined way. The frame is an integral component of photography and filmmaking. The continued relevance of such filmic conventions in a time of technological upheaval is a key question here. It is suggested that both filmmaking and VR will continue to offer unique and powerful tools for documentary storytelling in heritage interpretation, and that understanding the strengths of each will be important if we are to develop a well-considered visual toolkit that goes beyond the technological hype. As such, we test new norms of immersion and interaction afforded by recent developments in head-mounted display technology that might appear to be - and have certainly been promised to be - a paradigm shifting development in new media.

Keywords: Web visualization, digital archaeology, Laser Scanning, Photogrammetry, Early Bronze Age, Cyclades

Introduction

This paper stems from the author's own research-practice in filmmaking and Virtual Reality (VR) content development, and represents an effort to better understand how these distinct media instill particular ways of seeing according to the cultural context of their creation and consumption (see Moser & Smiles 2005). As such, the focus here is not only the explicit methods involved in each case but also the implicit meanings behind film and VR. Gauntlett (2018) reminds us of the pervasive ways in which new media - if left unchecked - can inadvertently af-

fect our everyday lives, but also remains optimistic that technological tools can act as catalysts to positive social change if used creatively. Such issues and considerations surrounding new media bring to bear upon the field of visualisation for built heritage in general, and in particular where public outreach and communication work aims to reach general audiences who are not versed in the specific visual syntaxes that are understood within archaeology. As this discussion relates to a visual cultural domain, the arguments are supported using a combination of critical





Figure 1. Still from *The Arrival of the Train at the Station*, Auguste and Louis Lumière, 1896, public domain image.

theory and examples from the author's creative research-practice. Insights can thus be gained through practice - particularly relating to the tensions between lived experience and visual media - that would be difficult to access through purely textual enquiry (see Cazeaux 2006; Biggs 2004).

At the outset the origins and "guiding myths" of film and VR are discussed and the notion of realism is problematised in relation to the two forms of new media. The significance of embodied engagement will be explored in terms of how this relates to phenomenological understandings of place, and the tensions between simulation and experience. In order to understand how these issues relate to recent technological developments, the types of embodied engagement and levels of interactivity that are afforded by current motion tracked VR systems will be expanded upon. Finally, two practical examples from the author's own research-practice in film and VR are discussed in terms of how the creative decisions made were affected by the affordances of each medium. The aim is to consider the relationship between creative practice and new media technology in the context of built heritage visualisation.

The Guiding Myths of Film and VR

Bazin (1967) proposed that the "guiding myth" behind the early development of film was the notion of

a "total reality", that is to say that the on-screen world could one day be indistinguishable from the real. For Bazin this myth would culminate in "an image unburdened by the freedom of interpretation of the artist or the irreversibility of time" (1967: 21). Although this was meant only as an originating ideology, if there has ever been an incarnation of Bazin's myth then it lies in the notion of actuality film, which was pioneered by the brothers Auguste and Louis Lumière.¹ Unlike their contemporaries, who embraced the illusory characteristics of the new medium, they attempted to show naturalistic scenes unmediated by artistic influence and artificial narrative. They are most renowned for their short film *The Arrival of the Train at the Station* (*L'Arrivée d'un train en gare de La Ciotat* Auguste, 1896; figure 1), which reportedly appeared so true to life that it sent frightened audiences running from theatres.

Except of course that it never did. In reality audiences of the time were not "naive spectators" as has sometimes been imagined but were able to distinguish between the real-world and the artifice of the projected image (Gunning 1989: 116). The attraction

¹ The Lumière brothers produced early cinematic equipment and naturalistic film content at the turn of the Twentieth Century, a time when stage magicians were also widely adopting the new technology, notably including visual effects film pioneer Georges Méliès. For a detailed account of this historical continuity between stage and screen see Barnouw (1981).



Figure 2. Using a HMD and motion controllers, photograph by the author, 2017

of cinema then lies in the aesthetic of the uncanny, or in the tensions of a partial reality, rather than in any manifestation of Bazin's total reality. This is evident in the explicitly artificial visual language of film today where constructs such as cuts, dissolves and montage - that have no equivalence outside of the film world - form part of a widely accepted visual syntax that is integral to the medium.

Manovich (2001) later drew parallels between Bazin's guiding myth and the aspirations of VR technology. In light of technological developments in new media he makes the provocative claim that "the promise of Bazin's 'total realism' appears to be closer than ever" (2001: 189). Certainly the "yearning" for a perfect facsimile of the real, facilitated by VR, proliferated decades before Head-Mounted Display (HMD) technologies had the comfort, rendering capabilities, and accessibility that they have today (Penny 1993: 18; Gillings 2005: 224). While Bazin's total reality might be a useful guiding myth, we can fully expect to see, as we have seen in film, that the emerging visual language of VR is defined as much by the artifice of the virtual as it is by integrity to the real.

With this in mind, instead of measuring film and VR by their proximity to the real it might be more useful to consider the ways in which they exploit the senses. The stereograph, popular in the late nineteenth century, used stereo vision to give a

sense of "presence" in what Gurevitch describes as a "proto-cinematic spectacular attraction" (2012: 243). Gurevitch compares a stereo-card depiction of a train approaching the viewer along a vertiginous bridge - produced by Benjamin Kilburn sometime in the late 1800s - to the film *The Arrival of the Train at the Station*. The suggestion here is that the way in which the stereograph and the motion picture call upon bodily engagement - through stereo depth perception on the one hand and the persistence of vision on the other - marked a radical departure from the apparent indexicality of the photograph, but also afforded both media the attraction of the spectacle. It is not the intention here to draw a direct parallel between VR and the stereograph - as stereo vision is only one element of modern-day VR - but rather to highlight that a play upon the senses in itself lends an attraction, and an uncanny type of realism, to new media. Where VR departs from film and stereography is with the augmentation of bodily interaction, facilitated by software feedback loops and motion control hardware.

Virtual Experience of Place?

What then do we mean by the seemingly oxymoronic virtual reality? While the term VR has been used in archaeology to refer to all types of computer gen-



Figure 3. General Gartner Research's Hype Cycle, diagram drawn by Olga Tarkovskiy (CC BY-SA 3.0), 2013.

erated imagery that tend towards “realistic” representation, today it more often refers specifically to the embodied interaction enabled by HMD technologies and motion control devices (figure 2). “The notion of the real” - Coyne states - “is intimately connected with embodiment” (1999: 49). Just as we might pinch ourselves to check if we are dreaming, as we look around in VR the live feedback loop that we receive convinces us in part that what we are seeing is real. This “reality check” is a type of reality illusion that is quite distinct from photorealism. Where in the past illusions of reality have primarily relied upon “visual fidelity”, Manovich argues that digital interactive media “construct the reality effect on a number of dimensions [including] bodily engagement with a virtual world (for instance, the user of VR moves the whole body)” (2001: 182). As such we can say that VR as we know it today is by its very nature interactive. To remove that bodily interaction would be to remove the primary illusion upon which the virtual reality is based.

The interactive and embodied nature of VR could then, at least in principle, make the medium a useful tool to explore built heritage - and landscape archaeology in particular - from a phenomenological standpoint. Brück suggests that modeling architecture and landscape in VR could be useful in this regard because it “overcomes the abstracted perspective of two dimensional mapping” (2005: 52). By simulat-

ing a human perspective we might assume that it is possible to “see” what it is like to move through an environment just as we might consider the experience of walking through a real place. Gillings has problematised such a view however pointing out that, beyond its use as a tool to assess choreography from ground level, VR should not be considered a proxy for - much less equivalent to - embodied experience of place (2005: 233). This is in part because the model is not the place, but also because VR systems - despite their ever-increasing sophistication - engender a specific way of seeing that remains far from an unmediated type of embodiment. Thomas has critiqued the affordances of VR modeling on both counts, pointing out the contradiction of using a simulation - representing only an illusion or the appearance of things - to access the thing itself, as well as the shortcomings of prioritising vision over multi-sensory experience (2004: 198-201). In order to bridge this gap between the lived experience of place and the types of perception that are allowed by a virtual model, we should consider more closely the nuance and complexity of human engagement rather than place undue expectations on improvements in VR hardware and software. As Coyne puts it:

“The ambitions of VR remind us that the real is that which resists representation. It is ineffable.” (Coyne, 1999: 269)

A number of suggestions have been made as to how we might attempt to imbue digital models with the sometimes “ineffable” experiential, socio-political and aesthetic dimensions that we can attribute to the real. At the outset, we must acknowledge that improvements in technology alone will not do this by default. This can sometimes seem contra to a prevailing culture of techno-optimism which permeates digital practices. What Huggett terms “technological fetishism” within archaeological practice may be driven by the lure of the “state of the art” (2004: 88) but it is also entwined - in potentially sinister ways - with the technology industries that generate both supply and demand for new hardware and software (see Perry & Taylor 2018: 17). The influence and vested commercial interest of these industries should not be overlooked. Perry and Taylor question the way in which technologies are often uncritically labeled as “emergent” - sometimes regardless of how long they have actually been around for - and point to where the “Gartner Hype Cycle” has been used to illustrate how the perceived significance of a technology can be driven by hype rather than due consideration of its actual capabilities (2018: 14; figure 3). Recent developments in VR are no exception to this, with claims of proximity to the real not only being often exaggerated but also missing the point that lived experience cannot be defined in such simple terms as resolution or frame rate.

How then might we strive to make more “real” - or at least more meaningful - digital experiences given the uncanny nature of virtual environments? As Jeffrey points out, while it is certainly possible to gloss over the “weirdness” of the digital object by focusing on narrative realism and thus exploiting the “suspension of disbelief” - for example through gamification - this should be approached cautiously in the context of digital heritage (2015: 150). An alternative is to focus on the co-production of digital artefacts and the adoption of more reflexive approaches to practice which respond to, and make more transparent, the processes and multiple voices behind digital media (Jeffrey 2015; Dallas 2015, Watterson & Hillerdal 2020). In doing so virtual spaces may be enriched with a sense of authorship and socio-political context in much the same way that real world artefacts and places are. In addition, solutions might be sought in creative

practice, either through collaboration with artists, or by the adoption of creative approaches within digital heritage (Gant & Reilly 2018; Perry & Taylor 2018; Watterson 2015).

As a media practitioner working with and for archaeologists, the author’s research aims to explore the role of creative practice in creating visualisations that communicate both the feelings and meanings surrounding archaeological sites. Central to this enquiry are the tensions between the lived experience of place on the one hand and the virtuality of new media on the other. Before discussing this research-practice, the technical affordances of VR technologies will be expanded upon. As noted at the start of this section, the term VR has tended to be used within archaeology as a broad definition encompassing a variety of types of engagement with computer generated graphics. The aim of this paper is to better understand what the creative toolkit looks like in the specific context of current VR systems, where embodied interactions are afforded by motion tracking technology. The following section will define those affordances in more detail.

Degrees of Freedom in VR

While all modern VR systems utilize motion tracking technology to provide visual feedback as the user moves their head, in practice this embodied interaction comes in different levels. At its most fundamental, VR allows the viewer to look around freely within 360-degrees of view. In technical terms this is known as three-degrees-of-freedom, in reference to the three rotational axis allowed by this type of movement. Additional levels of interaction allow a response to translational (lateral) movement of the HMD through space, as well as the augmentation of handheld motion control devices and other input and feedback loops. The addition of the three translational axis of movement to the three rotational axis means that these more sophisticated systems are referred to as six-degrees-of-freedom. These levels of interaction can also be broadly categorised as either Cinematic VR (CVR), where interaction is limited, or fully interactive VR where more extensive engagement with the virtual world is available.

Cinematic VR

Where in film the action takes place within a predetermined frame of view, CVR allows the viewer to look around from a fixed position in 360-degrees, albeit with limited interaction with the environment. This category includes both monocular and stereo 360-degree films when experienced through a headset, as well as 3D environments where the viewer is unable to fully navigate the space, and events take place according to a predetermined narrative. The compromise of CVR is that while the user is free to look in any direction, if their attention is to be directed towards important narrative elements it must be guided without the use of the frame boundaries available in film. In Mateer's (2017) review of the current state of CVR it is noted that, despite fundamental differences between the two media, some of the established methods used to guide the audience's attention in film can be translated for VR content:

"Film directors have developed several means by which they can control audiences and subliminally guide viewer gaze around the frame [...] Although some of these rely strictly on the limits imposed by a finite 'window' into the environment (i.e. the film frame), several are applicable in a CVR context [...]" (Mateer 2017: 21-22)

For example, Nielsen et al. (2016) conducted an experiment where different methods were used to guide a viewer towards the significant action within a short CVR piece. In one version the viewer's gaze was artificially altered to face certain directions at certain times. In another, a glowing firefly moved between points of interest in a way which was more naturalistic and consistent with the virtual world. While caution should be taken in seeking a general formula for new media practice - at the risk of overlooking the cultural contexts in which media operate - in this case it was found that the latter method of guiding the viewer's attention without interfering with the freedom to look around the scene was most successful. This might suggest an expectation for VR interfaces to be interactive in some way, even within the constraints of CVR.²

² In their experiments with various immersive forms of art installation Head & Sujir note that the use of a VR headset made people want to actively engage with the content (2020).

Fully Interactive VR

Taking engagement with the virtual world further, in fully interactive VR the user is able to interact to a greater degree with the environment and to move around the space more freely, sometimes assisted by navigation tools activated via the handheld controllers for example. This freedom of movement is a particularly powerful aspect of the VR medium in the context of built heritage as the notion of exploration is an important part of our engagement with heritage sites in the real world. This also represents a shift away from the relatively passive role of the observer in CVR - inherited from the paradigms of film - to a more participatory role that fully exploits the interactive capabilities of the new medium.

An example where this is done successfully is the MasterWorks project published by CyArk in 2018, which presents a variety of content based around four UNESCO world heritage sites in a VR environment.³ Central to the virtual experience is the ability to navigate around fully three-dimensional models of the four sites, produced using LiDAR and photogrammetry. While there are limits to the navigational scope of the models, the terrain and environment are extensive and featureful enough that exploring the sites by moving around using the HMD - aided by teleportation via the handheld controllers - is a significant part of the content in its own right. While the sites are contextualised with information on the archaeological interpretation and related portable artefacts, the virtual experience has not been fully gamified in that the viewer is free to explore outside of any predetermined narrative or goals. What makes this approach both accessible and relevant to the content is that it enriches the virtual interactions while mimicking the ways that we might explore such sites as a visitor.

Exploring Theory in Practice

Having introduced some of the technical affordances of VR, this section will report on examples of research-practice that have navigated some of the issues discussed here. The aim is to examine how

³ Available to download at: <http://www.masterworksvr.org/>



Figure 4. Ground-based filming for *The Caterthuns* film, photograph by Kieran Duncan, 2013.

creative decision making during production of the practical outcomes was affected by the limitations and affordances of the respective media. As a point of comparison the first example is a short film created during the author's PhD research, while the second is a VR environment developed at the 3DVisLab at the University of Dundee. Both projects aimed to create an emotive sense of place based upon real-world heritage environments. This sense of place is considered to be an important platform for communicating archaeological knowledge because it can be shared by specialists and non-specialists alike. Beyond this the experiences surrounding heritage sites can be an integral part of their archaeological interpretation. Despite the common aims of the two projects, the means by which real-world feeling and atmosphere was translated into digital content was markedly different in each case. This was governed partly by the situation of the sites themselves but largely by the disparate affordances of the two media used.

The Caterthuns Research Film

The *Caterthuns* is a short experimental film that uses aerial footage and digital models to tell the story of a pair of Iron Age hillfort sites in the region of Angus in Scotland.⁴ The aim of the film was to connect a sense of the landscape as it can be experienced from the ground with an impression of the sites' architecture - which is best seen from the air - along with their archaeological interpretations. To achieve this the film prioritised photographic composition in the field. By allowing the photographer/filmmaker to respond creatively to their own experiences, the intention was to allow them to influence the resulting imagery. The film is made up of footage taken from the ground, as well as kite aerial photography, drone footage and photography taken at higher altitudes from a light aircraft. While photogrammetry models were used for large parts of the film, these were adapted as a means to animate sequences of pho-

⁴ The film outcome can be viewed online at: <https://www.vimeo.com/147173130>



Figure 5. Stills from The Caterthuns short research film by the author, 2016.

tographs that were composed in the field, meaning that the final results remained closely related to the original imagery. This imagery was collected in all conditions, at different times of the year and different times of day, requiring multiple visits and intensive fieldwork spread over many months. Spending extensive time in the field was necessary to build an in-depth impression of the landscape and in order to approach the type of insider's view which Ingold termed the "dwelling perspective" (1993: 59). The variety of methods used for photography and filming also represented a conscious decision to engage with the sites in different ways and thus expand upon the ways of understanding the landscape through those experiences (figure 4). This approach has been explored in previous practice-based collaborations that prioritised time in the field (see Baxter 2014a; Waterson et al. 2014).

To allow the experiences of the fieldwork to filter through to the film outcome, creative decisions were made in response to aesthetic considerations such as mood and atmosphere. The choice of framing was a key component to this and played a significant part in the resulting short film (figure 5). It was noted that while some shots were carefully planned and involved returning to re-shoot a particular an-

gle in certain lighting conditions for example, others were more spontaneous and intuitive. This was particularly true of photography from the fast-moving light aircraft where, although careful route planning was undertaken pre-flight, photographs were often composed within a matter of seconds. Some of the strongest compositions were unplanned, and made in response to the particular conditions at the time of shooting. Making these creative decisions in-situ was a key way in which the lived experiences of the photographer/filmmaker were allowed to influence the visual results of the film. This relationship between multi-sensory experience and image is made possible through the creative use of photography (see Shanks 1997: 100), with the act of framing being a crucial part of this process. Collecting this photographic material in an open-ended way acknowledges the new understandings which emerge from the process of engagement during fieldwork and encourages these insights to guide the visual outcome, itself a product of the interaction between the landscape, the practitioner and their tools rather than a "projection" of a preconceived image (Ingold 2011: 178; see also Gosden & Malafouris 2015).

The animated movements of the camera were also carefully considered and executed using a combina-



Figure 6. The underwater survey team conducting photogrammetry on the HMS Hampshire, photograph by Marjo Tynkkinen, 2016

tion of filming and digital synthesis from still photographs. In practical terms these movements help to reveal the three dimensional form of the landscape (via parallax) but also afford an impression of flight above, and passage through, the landscape. Castro describes how aerial tracking cinematography can evoke “emotion” linked to both the feeling of flight and discovery of the landscape below (2013: 125).⁵

As such the pacing and gesture of these lines of movement were carefully composed - again drawing influence from Ingold (2007) - to bring the viewer on a journey around key features of the sites. As the camera moves the frame is constantly changing, revealing more or less of the landscape. In cinema framing is an important tool which can act not only as a passive conduit for the image but as an expressive medium for the filmmaker’s intentions (see O’Rawe 2011). Here the frame is used to gradually build up an impression of a multifaceted landscape, drawing attention to how the sites change as they are seen from the ground and from the air, as well as over time.

Some sequences take advantage of the novel possibilities afforded by the process of synthesising digital imagery. These include a shot which ascends from

a close-up of a human figure to a high aerial view over both sites, designed to “ground” the otherwise abstracted aerial perspective to a relatable sense of scale and presence within the landscape (see Baxter 2014b). Two other “impossible” shots that were made possible through digital synthesis transition between summer foliage and winter snow cover, showing the changing face of the landscape throughout the seasons. These “time-lapse” shots are important because they draw attention to the ways in which - unlike a digital model - the landscape is constantly undergoing change, revealing unexpected facets and forms. The transparent artifice of these shots is also intended to implicitly acknowledge the process of production behind the film because the audience are aware that these transitions can only exist in the filmic world. Similarly, speculative reconstructions of lost structures - modelled in collaboration with archaeological reconstruction artist Alice Watterson - are rendered photorealistically but fade in and out of view to emphasise that they have been artificially superimposed.⁶ Given the uncanny nature of filmic visual language discussed earlier in this paper, we can consider that photorealism is not necessarily at odds with the speculative nature of these reconstruc-

5 Castro is describing the film *In an Airship over the Battlefields* (*En dirigeable sur les champs de bataille*), produced by Lucien Le Saint in 1919, which made early use of the aerial tracking shot not long after the Lumière brothers also first began to experiment with filming from a moving platform.

6 The deliberate use of a dissolve effect to visually separate speculative reconstructions from the modern-day landscape while drawing the viewer’s attention to “the artificial nature of the imagery” was discussed in a previous research-practice project (Baxter 2014a).

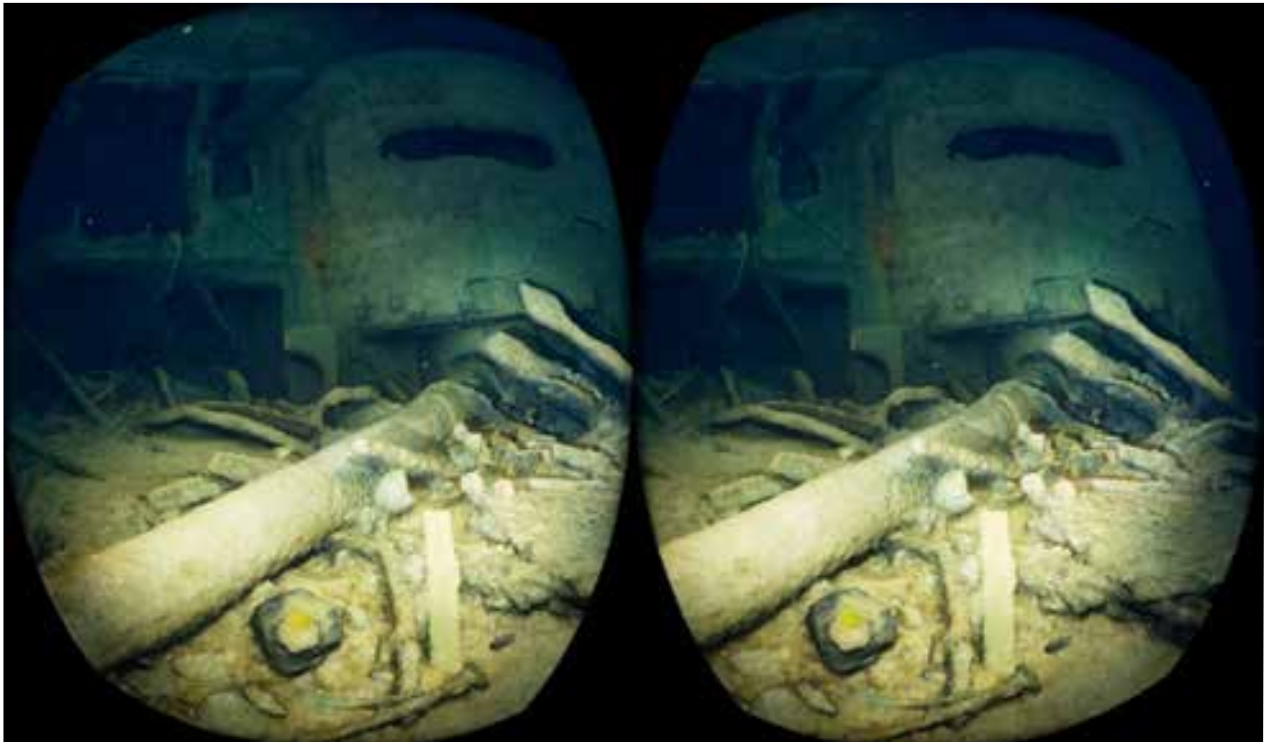


Figure 7. Still from HMS Hampshire VR environment developed at the 3DVisLab, University of Dundee, 2017.

tions (see Earl 2013). In the context of film there is an implied authorship understood by an audience who are aware that what appears on screen is some combination of artificial illusion and natural reality. This is reinforced by the format of *The Caterthuns* which is framed as the result of a creative process, revealing only a partial impression of a dynamic and multifaceted landscape which extends beyond the frame.

HMS Hampshire VR environment

HMS Hampshire is a World War One shipwreck and war grave located around three kilometres offshore of Marwick Head in Orkney. In 2016 a photogrammetric survey of the wreck was carried out under special permit by a team of divers using underwater cameras, high powered lights and technical diving equipment (see Macdonald et al. 2020; Rowland & Hyttinen 2017). Photogrammetry data from the survey was developed at the 3DVisLab at the University of Dundee to create a VR experience with the aim of allowing exploration of the site within an impression of what it is like to dive on a historic shipwreck. The process of developing the content from data collection to the final outcome was radically different from *The Caterthuns* film on two counts. Firstly, access to

the site is limited due to the shipwreck's depth, remote location and status as a war grave. This makes extensive and repeat visits for photography and filming logistically challenging at best, and impossible for those without technical diving skills. An experiential sense of place must be based on footage and first-hand accounts, in this case through collaboration with members of the underwater survey team (figure 6). In addition, while photographic framing in the field was integral to *The Caterthuns* project, the photogrammetry data used in this case was captured with the aim of complete coverage of certain study areas of the shipwreck. This type of survey is ideal for VR content as it allows the viewer to retrospectively explore the scene from any angle.

Visual cues were then added to the survey data to recreate the mood and atmosphere of the real-world site. This was made complicated by the fact that most of the development team and the vast majority of end users will never visit a subsea shipwreck, raising questions around what it means to recreate a realistic experience in the context of an activity (technical diving) which is far beyond everyday experience for most.⁷ This perhaps made it more likely that compro-

⁷ Similar epistemological questions can be applied

mises were made, for example where visibility was extended beyond the limits of the real-world environment to reveal more of the shipwreck. In addition, there is a tension between the realities of diving at the site and the aspirations of the data gathering process. Dynamic elements such as sea life and water visibility - while integral to the experiences of the subsea environment - hinder data collection and must be mitigated for, or even purposely removed from the data. Working with survey data that was collected with metric fidelity and comprehensiveness in mind was in sharp contrast to the photographic approach adopted for *The Caterthuns* film. For the HMS Hampshire project there was a point of departure - when the survey data is used to inform a visualisation aimed at communication to non-specialists rather than scientific analysis - beyond which portraying an authentic sense of place was deemed of equal importance as preserving the integrity of the data.

In light of this, certain elements were added based on the appearance of the underwater footage and the accounts of the survey team. As the viewer moves around the space, foreground details are illuminated by virtual lights that are attached to the handheld motion controllers emulating torch light. Floating particles were also added that both emulated the appearance of the sub-sea environment and also provide a point of reference in terms of depth and volume in the virtual space, reinforcing the movement of the HMD (figure 7). A fog effect simulates the way in which seawater occludes light, although as previously noted the viewer is allowed more visibility than is likely to be seen at the real-world site. These naturalistic elements were designed to encourage the viewer to explore the scene through their bodily interaction, as moving the HMD and motion controllers reveals more or less of the environment.

Rather than viewing the photogrammetry data as a digital artifact distanced from the real thing, here we are using VR to present a historic shipwreck in the context of the experiences that could be expected when diving on such a site. This is important because it affords the viewer a sense of discovery, but critically a sense of presence, an impression that the virtual model relates to a real world heritage environment

that could be visited, albeit in this case with great difficulty due to the site's location and protected status. Unlike at the Caterthuns which are relatively easily visited there is a remote access issue here, with VR being the closest that both specialists and non-specialists are likely to come to visiting the HMS Hampshire. This project explored how this can be done in a way that respects the integrity of both the underlying data and the aesthetics of the site's situation.

Conclusion

Despite the tensions between the reality of lived experience and the virtuality of new media it is possible for some aspects of what Jeffrey terms the "aura" of physical sites and artefacts to transmit to their simulated counterparts (2015: 146). Creative approaches to practice leave space for the invisible elements of real-world places to influence the visual, for example through evocative mood and atmosphere.⁸ Throughout the practical examples explored here we have seen how the creative toolkits that facilitate this differ between media. The inherently interactive nature of VR sets it apart from film where the viewer's attention is guided by the way in which footage is framed. In film, framing can be used as an expressive tool to tell the story not only of the on-screen elements but also of the experiences of the photographer/filmmaker and the broader landscape that lies beyond the frame. In VR other methods can be used to reintroduce experiential elements of the real-world environment into the virtual space. These should reinforce the interactive nature of VR engagement where possible, while also drawing from real-world observation and experiences.

The guiding myths that drive the development of new media do not necessarily define the visual languages and practices that are later adopted. A modern incarnation of Bazin's notion of the guiding myth might be seen in the Gartner Hype Cycle (figure 2), where new technologies must pass through a "peak of inflated expectations" before eventually settling onto a "plateau of productivity". As researchers and practitioners we have a responsibility to see past this

more generally to archaeology and digital modelling where knowledge is created through specialist practices which are unavailable to many (see Dallas 2015; Carter 2017).

⁸ Shared experiences of landscape may be evoked through atmosphere (see Jóhannesdóttir 2010), which may comprise elements beyond the visual, such as soundscape for example (see Gant & Reilly 2018).

cycle, particularly where there is vested commercial interest behind the hype, and to concentrate instead upon the “slope of enlightenment”. Here the truly novel benefits of a new medium can be exploited, and emerging tools can find a place within the existing toolkit for storytelling that is available to heritage professionals and creative practitioners. Understanding these new affordances and their implications is important if we are to ensure that heritage visualisation practice is theoretically grounded (Huvila & Huggett 2018). It is after all the ways in which we critically and creatively adapt digital media, not the technology itself, that will determine our ability to meaningfully visualise heritage environments. VR represents a radical departure from film not because it is a step closer to a total reality but because the embodied interaction that it facilitates represents a novel form of engagement with virtual places and artefacts. While the possibilities that this presents have great promise in the field of built heritage visualisation they do not threaten to overtake the paradigms of filmic language. Instead we can expect VR to stand alone as a new and alternative medium with its own distinct affordances.

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Reference

- Barnouw, E 1981** *The Magician and the Cinema*. New York, Oxford University Press.
- Baxter, K 2014a** Jarlshof Lost and Found: Low altitude aerial photography and computer-generated visualisation for the interpretation of the complex settlement remains found at Jarlshof, Shetland. *Internet Archaeology* 36.
- Baxter, K 2014b** Grounding the Aerial: The Observer’s View in Digital Visualisation for Built Heritage, *Electronic Visualisation and the Arts: proceedings of the EVA 2014 conference*, London, pp. 163-170.
- Bazin, A 1967** (translated 2005) *What is Cinema?: Essays selected and translated by Hugh Gray. Volume 1*. Berkeley, University of California Press.
- Biggs, M 2004** Learning from Experience: approaches to the experiential component of practice-based research. *Forskning, Reflektion, Utveckling* 6(12): 7-21.
- Brück, J 2005** Experiencing the past? The development of a phenomenological archaeology in British pre-history. *Archaeological Dialogues* 12(01): 45-72. DOI: 10.1017/S1380203805001583
- Carter, M 2017** Getting to the point: Making, wayfaring, loss and memory as meaning-making in virtual archaeology. *Virtual Archaeology Review*, 8: 97-102. DOI: 10.4995/var.2017.6056
- Castro, T 2013** Aerial Views and Cinematism, 1898-1939. In: M Dorrian and F Pousin (eds.) *Seeing From Above: The Aerial View in Visual Culture*. London, I. B. Tauris: 118-133.
- Cazeaux, C 2006** Interrupting the artist: theory, practice and topology in Sartre’s aesthetics. Macleod & L Holdridge (eds.) *Thinking through art: reflections on art as research*, London, Routledge, pp. 40-50.
- Coyne, R 1999** *Technoromanticism: Digital Narrative, Holism and the Romance of the Real*. Cambridge, MIT.
- Dallas, C 2015** Curating Archaeological Knowledge in the Digital Continuum: from Practice to Infrastructure. *Open Archaeology* 2015, 1: 176-207.

- Earl, G 2013** Modeling in archaeology: computer graphic and other digital pasts. *Perspectives on Science*, 21(2): 226-244.
- Gant, S & Reilly, P 2018** Different expressions of the same mode: a recent dialogue between archaeological and contemporary drawing practices, *Journal of Visual Art Practice*, 17(1): 100-120.
- Gauntlett, D 2018** *Making is Connecting: The social power of creativity, from craft and knitting to digital everything, Second expanded edition*. London, Polity.
- Gillings, M 2005** The Real, the Virtually Real, and the Hyperreal: The Role of VR in Archaeology. Smiles S and Moser S (eds.) *Envisioning the Past: Archaeology and the Image*, London, Blackwell, pp. 223-239.
- Gosden, C & Malafouris, L 2015** Process archaeology (P-Arch). *World Archaeology*, 47(5): 701-717.
- Gunning, T 1989** An Aesthetic of Astonishment: Early Film and the (In)Credulous Spectator. *Art and Text*, 34: 114-133.
- Gurevitch, L 2012** The Birth of a Stereoscopic Nation: Hollywood, Digital Empire and the Cybernetic Attraction. *Animation: An Interdisciplinary Journal*, 7(3): 239-258.
- Head, A & Sujir, L 2020** Researching virtual, augmented and mixed realities, or how the Elastic 3D Spaces project emerged from an outdoor projection event. Menotti G & Crisp V (eds.) *Practices of projection: histories and technologies*, Oxford, Oxford University Press. pp. 155-172.
- Huggett, J 2004** Archaeology and the new technological fetishism. *Archeologia e Calcolatori*, 15: 81-92.
- Huvila, I & Huggett, J 2018** Archaeological Practices, Knowledge Work and Digitalisation. *Journal of Computer Applications in Archaeology*, 1(1): 88-100.
- Ingold, T 1993** The Temporality of the Landscape. *World Archaeology*, 25(2): 152-174.
- Ingold, T 2007** *Lines: A Brief History*. London, Routledge.
- Ingold, T 2011** *Being Alive: Essays on Movement, Knowledge and Description*. London: Routledge.
- Jeffrey, S 2015** Challenging Heritage Visualisation: Beauty, Aura and Democratisation. *Open Archaeology*, 2015(1): 144-152.
- Jóhannesdóttir, G 2010** Landscape and Aesthetic Values: Not Only in the Eye of the Beholder. Benediktsson K and Lund K (eds.) *Conversations with Landscape*, New York, Routledge, pp. 109-124.
- Macdonald, R, Wade, B, Turton, E, Haynes, P, Crofts, D and Rowland, C 2020** *HMS Hampshire 100 Survey 2016, Survey Report 2020*. University of Dundee, UK.
- Manovich, L 2001** *The Language of New Media*. London, The MIT Press.
- Mateer, J 2017** Directing for Cinematic Virtual Reality: how the traditional film director's craft applies to immersive environments and notions of presence. *Journal of Media Practice*, 18(1): 14-25.
- Moser, S & Smiles, S 2005** Introduction: The Image in Question. Smiles S & Moser S (eds.) *Envisioning the Past: Archaeology and the Image*, London, Blackwell: 1-12.
- Nielsen, L, Møller M, Hartmeyer S, Ljung, T, Nilsson N, Nordahl R, and Serafin, S 2016** Missing the point: an exploration of how to guide users' attention during cinematic virtual reality. Kranzlmüller, D & Klinker, G (eds.) *Proceedings of the 22nd ACM Conference on Virtual Reality Software and Technology*, pp. 229-232.
- O'Rawe, D 2011** Towards a poetics of the cinematographic frame, *Journal of Aesthetics & Culture*, 3(1).
- Penny, S 1993** Virtual Bodybuilding. *Media Information Australia*, 69: 17-22.
- Perry, S & Taylor, J S 2018** Theorising the Digital: A Call to Action for the Archaeological Community. Matsumoto M & Uleberg E (eds.) *In Oceans of Data: Proceedings of the 44th Conference on Computer Applications and Quantitative Methods in Archaeology*. Oxford, Archaeopress, pp. 11-22.
- Rowland, C & Hyttinen, K 2017** Photogrammetry in Depth: Revealing HMS Hampshire. *Electronic Visualisation and the Arts: proceedings of the EVA 2017 conference*, London: 358-364.
- Shanks, M 1997** Photography and Archaeology. In: Molyneux B (ed.) *The Cultural Life of Images: Visual Representation in Archaeology*, London, Routledge: 73-107.
- Thomas, J 2004** *Archaeology and Modernity*. London, Routledge.
- Watterson, A 2015** Beyond Digital Dwelling: Re-thinking Interpretive Visualisation in Archaeology. *Open Archaeology 2015*, 1(1): 119-130.
- Watterson, A, Baxter, K and Watson, A 2014** Digital Dwelling at Skara Brae. Russell I and Cochrane A. (eds.) *Art and Archaeology: Collaborations, Conversations, Criticisms*, London, Springer: 179-195.
- Watterson, A and Hillerdal, C 2020** Nunalleq, Stories from the Village of Our Ancestors: Co-designing a Multi-vocal Educational Resource Based on an Archaeological Excavation. *Archaeologies: Journal of the World Archaeological Congress 2020*.

