DOCTOR OF PHILOSOPHY

Topography and flight

The creative application of aerial photography and digital visualisation for landscape heritage

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Topography and flight: The creative application of aerial photography and digital visualisation for landscape heritage

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Abstract

Aerial photography and digital visualisation technologies are commonly used to reveal and interpret archaeological sites and landscapes. These methods afford a clarity and overview that has considerable advantages in heritage visualisation. Despite this, both technologies offer a view that is distanced from the grounded experiences that are integral to heritage sites and landscapes. This tension, between visualisation technologies and lived experience, is significant because the experiences of visiting these places are a valuable common platform - shared by specialists and general audiences alike - for communicating archaeological narratives. Beyond this, such tensions have been central to debates within landscape archaeology about how embodied perspectives on the one hand, and the conventions of visual representation on the other, might affect archaeological interpretations. This thesis investigates the hypothesis that creative practice can serve to bridge the gap between visualisation technologies and lived experience, ultimately providing more powerful and meaningful visualisations of landscape heritage.

This is possible because aerial and digital visualisations can and do go beyond topographical representation and respond to the aesthetic and emotive dimensions of landscape. Aerial photographs and digital models resist the visual modes of modernity despite their technological premise. The meanings that they transmit draw not only from the visual language of aerial photography and digital media but also from the viewer's prior experience of landscape and flight. It is within this context that this study attempts to better understand the relationship between visualisation technologies, creative practice, and the lived experience of landscape. To do this the author adopts the role of research-practitioner in order to explore and demonstrate the arguments through the creative application of aerial photography and digital visualisation technologies. This practice combines methods from archaeological survey, and approaches from visual effects filmmaking, with an aesthetic inspired by artist-photographers like Marilyn Bridges, Emmet Gowin and Patricia Macdonald. These creative practitioners have adopted the aerial view to portray landscapes with intimacy, agency and dynamism. The practice aims to work from an immersed or insider's view, drawing influence from Tim Ingold's notion of the "dwelling perspective". A main case study is undertaken at the Iron Age hillfort site of the Caterthuns in Angus, Scotland, with supporting case studies at the prehistoric site of Links of Notlland in Orkney and additional hillfort sites in Strathearn. Through this hands-on experience the aim is to better understand how novel approaches to practice can improve landscape heritage visualisation in an interdisciplinary context.

Research activities

Conference papers

Watterson, A., Baxter, K., and Watson, A. (2012). “Digital Dwelling at Skara Brae: a collaborative case study in archaeological visualisation.” Paper presented at *Display: Consume: Respond - Digital Engagement with Art, CHArt 28th Annual Conference*, The Association of Art Historians, 15th - 16th November 2012.

Baxter, K. (2014). “Grounding the Aerial: The Observer's View in Digital Visualisation for Built Heritage.” Paper published in *Electronic Visualisation and the Arts: proceedings of the EVA 2014 conference*, eds. K. Ng, J. Bowen and S. McDaid, London, BCS: 163-170.

Baxter, K., Was, J., Watson, A. and Watterson, A. (2014). “Approaching Links of Noltland: Using analogies of travel and arrival to visualise a remote prehistoric settlement.” Paper presented at *Northern Peripheries Network, Further North Conference*, University of Northumbria, 4-5 September 2014.

Poller, T., Watterson, A., Baxter K. (2015). “Crafting Digital Engagements with the Archaeological Interpretation of a Scottish Hillfort.” Paper presented at the *Annual Meeting of the European Association of Archaeologists*, University of Glasgow, 2-5 September 2015.

Relevant publications

Baxter, K. (2014). “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.

Waterson, A., Baxter, K., Watson, A. (2014). “Digital Dwelling at Skara Brae.” *Art and Archaeology: Collaborations, Conversations, Criticisms*, eds. I. Russell and A. Cochrane, London: Springer: 179-195.

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Declaration

This thesis is the work of Kieran Andrew Baxter. The author is solely responsible for the contents. The contents of this thesis have not been submitted for any other higher degree.

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Introduction

It is not the intention of this thesis to further promote the technologies of aerial photography and computer generated imagery (CGI). Much enthusiasm already surrounds these image-making tools, driving their technological development, while comparatively little attention is paid to their function within the context of visual culture. This thesis will focus on the meaning, not the methods, of such visualisation technologies. It is about the *application* of hardware and software that is already established. Specifically it will argue that creative practice, with its ability to deal with the aesthetic and emotive aspects of place, is uniquely placed to provide more meaningful and powerful visualisations for landscape heritage. This study is practice-based, meaning that the author will adopt the role of research-practitioner in order to explore and demonstrate the theoretical arguments in practice.

The ways in which the technologies of aerial photography and CGI may be applied creatively to improve public heritage interpretation have already been explored by the researcher (Baxter, 2014). In this previous project, low altitude aerial photography was gathered in the field and processed in a computer lab to create a digital three-dimensional model that was animated to interpret the archaeological features of the site of Jarlshof, Shetland. At the outset this pilot project aimed to reconstruct the topography of the site as accurately as possible. This approach soon shifted to one where the intent was to recreate the evocative mood and atmosphere that was experienced during the fieldwork. These dynamic and experiential dimensions of the landscape were considered to be a compelling platform from which to tell the archaeological stories of the site. The changing lighting and weather, integral to the place, were incorporated into the final short film outcome *Jarlshof* (figure 0.1). A paradox became apparent whereby the aerial and digital representations, that were so useful in illustrating the topographical form of the site, were necessarily distanced from the grounded experiences that were so key to the interpretation. At the same time it was felt that the sensation of flight above the landscape, which this type of visualisation alluded to, was a powerful and evocative way to give an impression of these experiences. These preliminary investigations established the main research question of this thesis: How can creative practice serve to bridge the gap between visualisation technologies and the lived experience of landscape heritage?

Figure 0.1 - Prehistoric settlement site at Jarlshof, Shetland. Kite aerial photograph by the author, 2012.

Aerial photography and CGI are employed in a variety of contexts including within archaeology for detecting, surveying and interpreting sites and landscapes. If we define visualisation as “the process of making the invisible visible” (Cox: 1993: 89), then we can consider that both of these technologies make visible archaeological features that are invisible from the ground. They are very good at doing this but, more than this, they also have the potential to visualise the human stories related to landscape heritage that are invisible because they exist only in the interpretations of archaeologists. These visualisation technologies are not passive vehicles for archaeological narratives however, but rather impose their own meanings depending on the context of their creation and viewing. Moser and Smiles remind us that “representation is never innocent [...] no pictorial device can be a transparent illustration of the world, but instead deploys technical devices, formal conventions, and ideological assumptions to orchestrate meaning” (2005: 1). The types of images frequently used to record landscape heritage - maps, plans, aerial photographs and digital models - have been brought into question by archaeologists who are interested in how the experiential dimensions of landscape affect their interpretations. Thomas highlights the influence of post-Enlightenment modernism behind such technological images and claims that these are ill equipped to deal with the cultural meanings of archaeological landscapes:

> “Digital technologies reduce the past to a pattern of pixels, viewed on a screen of modern rationalism. It may be possible to develop a sensuous, experimental archaeology of place and landscape […] But it is questionable how far this process can be facilitated by a microprocessor.” (Thomas, 2004: 201)

In recent decades the study of British prehistory in particular has become increasingly concerned with how lived experience shapes both modern and prehistoric perceptions of landscape. Central to these debates are the biases imposed by the aerial and digital images favoured in archaeology, which offer a distanced and disembodied view of the past. “The view from the airplane is, of course, inhuman”, says Tilley, “[w]e do not normally see or experience landscapes in this manner” (2008: 272). These observations illustrate the tensions that exist around aerial photography and CGI as tools for interpreting landscape heritage. Digital topographical maps, derived from airborne Lidar (laser scanning) or photogrammetry for example (Figure 0.2), might contain detailed information about archaeological features when interpreted by an expert observer but reveal little about what it might be like to visit the site. Aerial photographs can serve to place archaeological features within their landscape context, especially when taken at an oblique angle towards the horizon (figure 0.3), but remain distanced from the earth's surface. Despite these characteristics, aerial and digital images *do* resist classification as technological images divorced from lived experience. This is because, within the cultural context of viewing, their meaning goes beyond what is directly represented and draws from the viewer's prior knowledge of landscape, flight and the visual language of digital media. Here it will be argued that the tensions between the distance and familiarity of the aerial view, or the realism and virtuality of the digital model, can and do evoke the experiential dimensions of real-world landscapes. Beyond this it will be argued that creative practice is uniquely positioned to exploit these tensions because it is well equipped to deal with the aesthetic and emotive dimensions of landscape, and because it embraces the cultural context within which images are read. This hypothesis will be explored in theory and practice.

Figure 0.2 - Digital topographical map derived from aerial photographs showing subtle archaeological features, Castle Law Forgandenny Iron Age hillfort site in Perthshire. Created by the author, 2013

Figure 0.3 - Castle Law Forgandenny Iron Age hillfort site with the Earn valley behind. Oblique aerial photograph taken by the author, 2013.

This thesis sets out to answer the question of how can the creative application of visualisation technologies better respond to the lived experience of landscape heritage. To do this, it will be important to understand how visualisation technologies operate within the context of visual culture. The contextual review is, by necessity, broad in scope. This is because the theoretical background of the aerial view, CGI and archaeological visualisation is diverse and nuanced. Chapter one will examine the ways in which aerial photography has been employed as an instrumental tool in such fields as military reconnaissance, urban/rural planning, and archaeology. It will be considered that the air view has resisted the globalising, modernising and mechanised forces that drove its technological development, and continues to offer local, individualised and humanised perspectives of landscape. Chapter two will explore where the view from above has been used explicitly within the context of artworks in both painting and photography. Here the ability for the aerial view to respond to the experiences of flight has been exploited by those who are interested in expressing their emotional, aesthetic and individual relations to landscape. In chapter three the origins of digital media will be explored in the context of cinema and filmic language. The various meanings of *realism* in digital media will be examined in terms of both the appearance and the meanings behind CGI. Lastly, the ways in which image-making has affected archaeological processes, and the relationship between archaeology and creative practice will be expanded upon in chapter four. The debates within landscape archaeology concerning the use of aerial and digital visualisation technologies will be considered, and previous attempts to address these issues in practice will be examined.

While theoretical argument is a good way of identifying the context and conceptual issues surrounding heritage visualisation, here it is argued that the solutions lie in practice. A practice-based methodology will be outlined that will tackle the research questions and examine the relationship between creative practice, lived experience and visualisation technologies. This will involve the creative application of various methods of aerial photography and CGI, and the development of short film outcomes that aim to visualise and interpret archaeological sites and landscapes. One main case study and two supporting case studies will explore and demonstrate the extent to which creative practice, in an interdisciplinary context, can lead to more evocative, powerful and meaningful visualisations of landscape heritage.

Chapter 1 - Aerial photography: The cultural resistance of the technological image

1.1 Introduction

Aerial photography is an inherently technological image-making process facilitated by advances in the machinery of aviation and photography that occurred early in the Twentieth Century (Weems, 2011: 223; Hauser, 2007: 161). This technology allows us to visualise landscapes from perspectives that would be inaccessible otherwise, and provides a tool for mapping large areas with unprecedented efficiency. While the view from above has been adopted for many different purposes - including explicitly for the creation of artworks as will be discussed in the next chapter - the majority of aerial photographs are taken for the purpose of survey and reconnaissance. The technological nature of these images affords them an apparent scientific authority that has allowed them to be aligned to the projects of modernisation that occurred during the Twentieth Century.

If high altitude imagery can be affiliated to the modernist ideals of rational order and advancement through technology, then the Blue Marble photograph (figure 1.1) may have marked the "highpoint" of this progression. The photograph was taken in 1972 by the crew of the Apollo 17 spacecraft and shows the entire earth within a single frame. It is estimated to be one of the most reproduced images of all time and, according Cosgrove and Fox, represents the "definitive God's eye view" (2010: 86). This single image evidences a pinnacle of technological achievement, enabled by the sophisticated machinery of space flight and a specially modified Hasselblad camera. This photograph has an added impact because (unlike subsequent "Blue Marble" composites that were taken remotely) it also evidences a "human witness" behind the camera (Cosgrove and Fox, 2010: 86). We are reminded of the "heroic" astronaut who took the picture (Dorrian, 2013: 298). Among the new perspectives gained by the Apollo astronauts was a kind of enlightenment - what Frank White termed the "Overview Effect" (1944) - which had ramifications comparable to the "air mindedness" instigated by earlier aviation technology in the 1920s and 30s.

Despite apparently reaffirming the modernist ideals of human ingenuity, progress and globalisation, the images of the earth from space that emerged in the 1960s also tell a story of fragility in the face of the overwhelming apathy of the natural world. As Laura Kurgan puts it, the

Blue Marble photograph has become emblematic “not only of totality and unity but likewise of singularity and freestanding vulnerability” (2013: 10). Far from being an empowering reminder of human accomplishment, the Blue Marble photograph provides visual evidence of the isolation of the biosphere - what Buckminster Fuller termed the “spaceship earth” that supports all life - and has become an icon of both global ecology and environmentalism, rather than strictly one of technological accomplishment. This chapter will expand upon the historical links between the science of ecology and the politics of globalisation, consider how this relates to environmentalism, and explore the role of aerial photography in the development and dissemination of these ideas.

Figure 1.1 - "The Blue Marble", cropped from photograph AS17-148-22727 taken on December 7, 1972, by the crew of the Apollo 17 spacecraft at a height of about 18,000 miles. Public domain image.

The Blue Marble is typical of photographs from above in that despite its seeming impartiality as a technological image, apparently lacking local bias, it is loaded with a number of sociopolitical meanings. Weems advocates that the most “instrumental” of images should not escape the kind of cultural analysis that historians have applied to images explicitly created as artworks (2011:

229). This chapter will examine how aerial photography has been employed as an instrument for surveying landscapes - in such fields as wartime reconnaissance, land management and aerial archaeology - and the unexpected ways in which these apparently utilitarian images have resisted classification as such and taken on a cultural life of their own.

1.2 Wartime reconnaissance

Aerial photography owes much of its development to the warfare that gripped early Twentieth Century Europe. While some aerial photographs were taken by balloon in the late Nineteenth Century - the Parisian balloonist Nadar (Gaspard-Felix Tournachon) successfully photographed from a tethered craft as early as 1858 - it was the airplanes of the Twentieth Century that offered a truly viable platform for aerial survey. Balloons equipped with cameras had been widely used for reconnaissance during the American Civil War - unaided observation balloons had previously been used in the French Revolutionary Wars - providing strategic information to commanders from above the battlefield. Despite some success the inability to navigate these lighter-than-air craft was a severe handicap, leaving the balloonist either tethered above one spot or set adrift largely at the whim of the weather (Holmes, 2013: 122-155). Nineteenth Century ballooning ignited an interest in the possibilities of aviation - and a certain romance towards the heroic aviator - but could not be seriously considered as a tool for observation over large areas. Powered flight, driven by its wartime utility, would change this.

1.2.1 Optical warfare

At the turn of the Twentieth Century the problem of aerial propulsion was addressed first by powered rigid dirigibles - such as those developed by the German Ferdinand von Zeppelin - and later by the more agile heavier-than-air flight first achieved by the Wright brothers in 1903. The airplane offered a radically new platform for aerial vision. An aircraft could now go against the weather, powering itself to a predetermined vantage point rather than relying on unpredictable winds for transportation. During World War One developments in both aviation and photographic technology - accelerated by the war effort - played a central part in reconnaissance, with both sides of the conflict surveying the Western Front extensively to gather information on the movements and positions of the enemy (Cosgrove and Fox, 2010: 26-35). The aerial perspective had quite suddenly provided unprecedented quantities of information from behind enemy lines. To those in command this new vision empowered decisions which altered the course of the war,

but in a more immediate sense it affected the life and death of those on the ground. World War One had rapidly become, as Saint-Amour has put it, “the most optical war yet” (2003: 354).

The vertical photographs used in aerial reconnaissance could penetrate the surface of enemy territory revealing the positions of even well hidden trenches, infrastructure, troops and ammunition depots. Some of the most important insights could be gleaned from observing changes from one day to the next, meaning that regular and up-to-date surveillance was essential. Not only was the reach of this new aerial vision of the Western Front near total, it also went hand in hand with the destruction of landscape below. The machinery and skills that enabled these photographs were perfected through warfare. The aircraft and vertically mounted camera together had become a “superb seeing weapon” (Chmielewska, 2013: 232). Indeed aerial artillery and the reconnaissance camera have been considered metaphorically, as well as physically, interchangeable (Castro, 2013: 124). Writing on World War Two - by which time reconnaissance photography technologies were well advanced - Chmielewska considers that from the perspective of the pilot and photographer the distant earth's surface was stripped of all guises and reduced to a target for destruction under a brutal aerial gaze.

1.2.2 The heroic aviator

To the military commanders on the ground, the apparently omniscient privilege that aerial surveillance offered was tempered by logistics, not only in terms of capturing and developing such a large quantity of photographs but also by the necessary human interpretation of the results. Increasingly canny camouflage techniques meant that meticulous work was required to decode the photographs and a tremendous amount of manpower was needed for the task. The result was that aerial interpretation - far from belonging to the domain of a privileged elite - was undertaken at all levels of the military and drew skills from a diverse range of specialisms. Haffner (2013: 10-14) points out that successful interpretation required correlation with other information gathered at ground level which helped to piece together the narrative of enemy movements and intentions. To interpret features from abstracted vertical photographs required the imagination of individuals for whom the strangeness of the aerial view was becoming familiar.

To those embroiled in the conflict below the airmen and their machines were a hopeful reminder of freedom and heroism more than an emblem of privilege and power (Cosgrove, 2001: 239-240). Perhaps this was in part a legacy of the altogether more romantic age of ballooning that had fixed the idea of the aviator-adventurer in the public imagination during the previous century. Another

explanation places the heroism of powered flight on a broader arc of modernist ambition, one with which the first industrial - and truly global - war was also intimately entwined. While World War One had made bitterly clear the failings of the old order of aristocratic power in Europe, aviation promised - at least in principle - a democratising force where the individual hero, aided by technology, could make a profound difference in the world. In Britain, a country still holding power over its colonies, this ambition subsequently took on a distinctly imperial slant whereby the country itself became the self appointed hero (Anker, 2001: 82). Aerial photography provided a mode of vision which corresponded with the paradigms of the Modern Western World during the early Twentieth Century and subsequently had an impact in such fields as geography, architecture, agriculture and urban planning. The influence of airborne vision upon earthbound science, culture and policy became known as “air-mindedness” (Haffner, 2013: 14) and has been referred to more recently as “aeriality” (Weems, 2015: xi-xviii) or “Aereality” (Fox, 2009). According to this mindset, the technologies of flight and airborne photography would become instrumental in bringing order to the chaos of the post-war world.

1.3 The modernising aerial view

Aerial photographs have featured prominently in printed media since their beginnings (Roseau, 2013: 210-213). The influx of images that came during, and in the years following, World War One were enthusiastically disseminated in newspapers and magazines (Weems, 2015: 57-58). These images can be categorised into two types: vertical photographs, useful as mapping tools, and oblique views - taken at an angle between the vertical and the horizon - which provided a more familiar-looking type of elevated perspective. The oblique view offered a compromise between the type of panoramas available from ground level, with features arranged one behind another towards a horizon, and the cartographic benefits of the vertical. While oblique views taken at an angle close to the horizon were more difficult to extrapolate measurements from, they afforded a more humanised, “insider's” perspective that was closer to the experience of both the inhabitants of the landscape and the aviators themselves. In addition it was recognised that the oblique gave a better sense of three-dimensional “volume” (Macarthur, 2013: 188-193) particularly in regard to urban architecture where upright structures were oriented correctly in the photographic frame.

It was the combination of these perspectives - of the cartographic vertical and the more grounded oblique - that made aerial vision a powerful tool for the redevelopment of both urban and rural

landscapes in the interwar years. In the public imagination of the time “air-mindedness” was tied to a worldview whereby an increasingly holistic model of social order, organisation and improvement could be facilitated by the airplane (Haffner, 2013: 14). Amelia Earhart, an outspoken advocate of the holistic benefits of aviation during this period, summarises this association between flight and progress in her account of fellow pilot Anne Lindbergh’s “philosophy of flying”:

> “... aviation is one of the most progress-bringing occupations today. It is a new kind of transportation, and as such, is an important part of living.” (Earhart, 1932: 172)

Aerial photography was distinguished from a purely cartographic process because the photograph held the promise of an embodied human presence. These images were powerful rhetorical devices because they were tied to the heroism of the aviators behind the lens. This suggested that human ingenuity could finally impose order upon the landscape and build a brighter future using science and technology, ambitions that had been sustained since the Enlightenment.

1.3.1 Rural planning

Jason Weems (2004, 2011, 2015) has written extensively on how wartime aerial survey techniques were adopted for agricultural survey and planning in the American midwest during the interwar years. The scale of this operation mimicked that of the Western Front reconnaissance of World War One. During the 1930s alone over a million survey photographs were commissioned by the US agriculture department in a bid to both optimise and centralise land management (2011: 227). In the wake of the Great Depression much of the farmland in the North American Midwest had been overworked to the point of ruin. In response, the federal government looked to reform its land management under the politics of the “New Deal”. In line with the earlier Land Ordinance policies that had imposed the one mile square grid pattern that characterised the prairies, the New Deal aimed to “create order from chaos, to institute systematic control over a broad terrain, and to invest the lives of those who inhabited the prairies with democratic structures and ideals.” (Weems, 2015: 63). Aerial survey provided both the practical tools and the “synoptic mentality” (2015: 64) that made this organisational and political drive possible.

Weems argues that these images not only empowered government officials but also genuinely inspired farmers - otherwise critical of government oversight - to involve themselves in projects for agricultural improvement and modernisation (2015: 49). It is unlikely that this was an attribute

of the cartographic usefulness of the aerial photographs but rather of their human appeal. Their photographic nature meant that, unlike with a map, familiar features on the ground could be more easily recognised. Beyond this these images were viewed in the context of a broader dissemination of aerial photographs of the region, both vertical and oblique, which had already established the flying perspective in the imagination of the Midwestern farmer. Photojournalist Wallace Kirkland had used oblique aerial photographs amongst his ground level illustrations of life on an Iowa farm - published in LIFE magazine in 1937 - connecting aerial vistas of the endless grid-like landscape with his intimate observations of life on the ground (Weems, 2015: 144-125, Kirkland, 1955: 115-120).

1.3.2 Urban planning

In an urban setting, the aerial photograph had a similar role to play in connecting individual lives to the modernisation projects of the early Twentieth Century. Following World War One much of the equipment and expertise used in aerial reconnaissance was demilitarised. In Britain, the founders of the firm Aerofilms adapted wartime aerial survey methods to a commercial model and - following their temporary return to the war effort during World War Two - went on to gather an extensive catalogue of aerial photography specialising in the oblique view. Across Europe such images had an important role to play in the redevelopment of cities devastated by wartime bombing. In France the Service Topographique gathered and freely distributed aerial survey in a bid to assess damage and assist redevelopment after World War Two (Haffner, 2013: 70). These projects focused on the potential of aerial photography in urban planning, not just as a technical survey method but also as a media tool uniquely qualified for visualising metropolitan development (Roseau, 2013: 214). Such attempts to “condense a complex reality” using the totalising aerial view risks ignoring important “nuances and mechanisms” that support the urban fabric at ground level (Roseau, 2013: 215). An active imagination was required to connect aerial observations with ground level experiences. In city planning as in the rural American Midwest the oblique aerial view, rather than the more easily measureable vertical view, had an important role to play in this.

> “[oblique aerial photographs] suggest that the individual’s lived experience of places and the planner’s oversight of the whole socio-economic system that a city is, are points within a rotation from vertical to horizontal.” (Macarthur, 2013: 190)

Macarthur goes on to state that even vertical aerial photographs remain indexical - their *perspective* relating directly to a specific point in space - in contrast to the contrived and non-indexical *orthographic* projection of a map or plan. At any rate, according to Macarthur, the very photographic nature of the air photo marks it as indexical regardless of the viewpoint (2013: 192). Even in the orthographically rectified "orthophoto" there is a relation between the image and what an observer might see if they were above the terrain in person. As with the Blue Marble photograph, these images allow the viewer to see through the eyes of the aviator, in this case not an astronaut but an urban photographer. The specific indexicality implied in the aerial photograph invests the individual, rather than an unspecified authority, in these projects of modernisation. The apparently direct correspondence between image and landscape - devoid of external interference - seemingly leaves the observer to judge affairs for themselves. The photographs thus served as a platform for discourse between the stakeholders of urban development rather than as a purely didactic medium.

1.4 Global ecology and local environment

Regarding the stark contrast between the rigid grid patterns of the American Midwest and the organic flowing lines made by natural contours and watercourses, Weems suggests that the aerial view highlights the "friction that exists between natural and manmade orders" (2011: 225). While on the one hand this contrast brings up a dichotomy between humans and nature reminiscent of Enlightenment ideologies, it also also hints at the possibility of a broader "integrated system" composed of both human and natural components (Weems, 2015: 64). In the early Twentieth Century a new model of life as an interdependent network came into focus, one that crossed the divide between the human and the natural world. It was a vision inspired by the imagery made available by the airplane and crystallised by the emerging science of ecology.

> "The chief reason that ecologists were able to synthesize natural history into charts and maps of interrelations was their aerial perspective on nature. [...The] introduction of airplanes as tools for ecological research [...] moved ecologists from a local to a global perspective on the world - from local sand dune and mountain perspectives to global views provided by avant-garde aviation technology." (Anker, 2001: 77)

The "aerial perspective" that Anker refers to is not only the literal view of the Earth available to the airborne researcher but also the increasingly global worldview that arose at the beginning of the Twentieth Century. The emerging science of ecology was an attempt to understand broad

patterns and systems in nature in order to manage them effectively. Beyond this it was also an expression of a holistic worldview with sociopolitical consequences that helped to propagate the Western ambition of globalisation. As a tool for both imaging and transportation, aviation played a central part in these emerging worldviews.

1.4.1 Patrick Geddes and the Outlook Tower

Employing the aerial view to contextualise human activity within a broader network of relations was not an approach that was novel to the age of the airplane. Patrick Geddes (1854-1932) was a Scottish ecological thinker and early pioneer of town planning who believed that social and architectural improvement could only be achieved by viewing a broader picture that connected the local to the global. In 1892 Geddes purchased a camera obscura and public observatory at the top of the Royal Mile in Edinburgh (figure 1.2; figure 1.3). He named this the Edinburgh Outlook Tower and repurposed it to provide citizens with a synoptic view of the city. The Outlook Tower was meant as a prototype for similar installations to be built in all major cities, providing the overview that was central to Geddes' bold new vision of civic planning. To Geddes the city could only be properly understood in relation to the region, which in turn was an integral part of a global network of relations. This was represented in the exhibits displayed on the five floors of the Edinburgh Outlook tower, which descended from the immediate surroundings visible from the camera obscura, down through Scotland, the English speaking world, Europe, and finally the World (Welter, 2002: 78-80).

Figure 1.2 - The camera obscura on the roof of the Edinburgh Outlook Tower building purchased by Patrick Geddes in 1892. Photograph by the author, 2016.

Figure 1.3 - Emblem with cross-section of the camera obscura on the top of the Edinburgh Outlook Tower. Views of the city are projected onto a horizontal screen and observed from above. Photograph by the author, 2016.

Geddes' model of an interdependent network of relations, envisioned through the synoptic aerial view, was a forerunner for the new science of ecology that emerged around the turn of the Twentieth Century. While ecologists had begun by categorising local ecosystems of plant and animal life, the technology of aerial photography assisted in broadening their study to include forestry, zoology, and eventually human sociology and the global interaction of cultural and natural forces. Although this new discipline defined itself as holistic, the philosophy behind it was driven by set of economical and political aims that propagated the superiority of Western power (Anker, 2001: 76-78).

1.4.2 Globalisation and postcolonial imperialism

The inclusion of the English language as one of the regional spheres of Geddes' Outlook Tower reveals an inherent colonialism that was prevalent during the development of ecology as a scientific discipline. When in the 1920s British ecologists used aerial photography to map out Africa's natural resources, indigenous people "had to be either ignored or naturalized to be scientifically and politically manageable" (Anker, 2001: 84). Here mapping was used to claim what Macarthur describes as "political sovereignty" (2013: 199) over a given terrain, based on the assumed superiority both of the synoptic view and scientific rationality in general. This cartographic "intellectual colonization" (Cosgrove, 2008: 155) belongs to the broader history of maps and mapping, and was crystallised by the science of ecology and the methods of aerial survey.

What the era of the airplane brought to this project was the rapid coverage that allowed for a truly global view of the world. While the efficiency of aerial survey methods transformed cartographic practice, the availability of air travel also played a significant part in the air mindedness that shaped Twentieth Century worldviews. By reducing the time between international destinations, air links made globalisation a real and achievable project. Following World War Two, civil airlines capitalised on the ideals of "human freedom, unity, and equality through universal communication" promised by global air travel (Cosgrove, 2001: 225). At the same time the personal experience of viewing the earth from an aeroplane became established in visual culture (Dreikausen, 1985: 62-63).

During the 1960s the technology of space flight brought a new realisation to the ideals of globalisation envisioned by ecologists. The architect and systems theorist Buckminster Fuller advocated a holistic worldview and popularised the concept of a global system which he explored

in his 1969 book “Operating Manual for Spaceship Earth”. Fuller also popularised the architectural form which he named the geodesic dome, a spherical structure conceptually emblematic of his proposed global system. Not only was the geodesic dome constructed of a network of interdependent components, but when completed the shell of such a dome could create a bubble, within which a self-reliant ecosystem could operate. The isolation of the planet - the “spaceship earth” - was, according to Fuller, what necessitated the design of a holistic and close-knit network within. The geodesic dome made use of the naturally occurring efficiencies of both the sphere and its triangular components. This ingenious engineering solution that would allow human habitation in even the harshest environments, as evidenced by the geodesic dome that protected the research station embedded in the ice at the South Pole (Fox, 2005: 113-115). On the surface Fuller’s architecture demonstrated how, by imitating nature, mankind had the potential to live sustainably alongside it. His ideas also represented a particular model of the natural world however, a global system that left little scope for local differences.

Figure 1.4 - “Earthrise” photograph taken from Apollo 8 spacecraft from moon orbit, December 24, 1968. Public domain image.

The architectural shape of the globe was to become emblematic of global reach and international connectedness, but also of ever-expanding imperial boundaries. Cosgrove (2001: 228) argues that the inclusion of the architectural globe as spectacle in world fairs and exhibitions - such as

the "Montreal Biosphère" first constructed for the 1967 world fair - was designed to promote the global reach of Western power.

> "Model globes are emblems of an *idea* that such spectacles share with other globalized exhibition spaces of the modern metropolis, [...] using the public display of knowledge to signal authority and possession of an empire of knowledge." (Cosgrove, 2001: 228, original emphasis)

The popularisation of the globe as entity and emblem was facilitated by the images of the earth that were emerging from the space programs of the 1960s. The publication of Fuller's book "[...]Spaceship Earth" coincided with the release of the "Earthrise" image taken by Apollo 8 astronaut William Anders from moon orbit in December of 1968 (figure 1.4). This photograph mimicked a similar monochromatic image transmitted remotely by the unmanned Lunar Orbiter 1 in 1966, and was taken four years previous to the "Blue Marble" image of Apollo 17. Despite its technological nature "Earthrise" soon took on a life of its own as a cultural artefact, loaded with a dynamic set of sociopolitical meanings. While there is no doubt that "Earthrise" provided an image of a united humanity unhindered by political borders, the image has been variously read as a humbling symbol of humanity's shared goals and reliance on the Earth's systems, or alternatively as a claim to an intellectual global sovereignty by the U.S. and by Western ambition as a whole (Cosgrove, 2001: 259-260). As we have seen, it is difficult to divorce ecology from the politics of globalisation. The shortfall of ecological theory is that it fails to account for the hierarchical structures of power in human society.

1.4.3 Environmentalism

One reading of the 1960s photographs of the globe is that they supported the ideals of globalisation, tied to a kind of intellectual imperialism, within the postcolonial Western world of the time. Cosgrove raises an alternative reading of the "Blue Marble" image in particular, suggesting that its "decentralisation" from the Atlantic and Mediterranean origins of Western power in favour of Africa and Antarctica marks a novel shift towards a "decolonised globe" (2001: 261). To Cosgrove the image can also be aligned to a new drive to embrace the diversity of individual localities, and to respect the equality of these different voices. This is opposed to the politics of global ecology, which assume that these local differences can be resolved into a unified whole. Cosgrove continues:

> "[Blue Marble's] apparent absence of cultural signifiers has made it a favoured icon for environmental and human-rights campaigners and those challenging Western humanism's long-held assumption of superiority in a hierarchy of life." (Cosgrove, 2001: 261)

In support of this view, Kurgan notes that "the value of Lansat and SPOT [remote sensing satellite] image data was noticed more quickly and put to work more readily by environmentalists than any other advocacy group" (2013: 113). While remote sensing is a valuable practical tool for environmental sciences it also makes a useful vehicle for narrative as will be discussed later in this chapter.

Similarly the capacity for aerial photography to illuminate environmental issues benefits from both the practical advantages of the revealing aerial perspective and the added rhetorical value of the air view. Popular aerial photographers often attribute environmental messages to their images such as in Yann Arthus-Bertrand's publication "The Earth from the Air" (1999), which assumes a holistic narrative by both its airborne perspective and its global coverage. Despite this Arthus-Bertrands images are unavoidably localised. They are stamped with his own individual style which evokes a visceral and personal sense of place (Lugon, 2013: 148; Dorrian, 2013: 294). This personal relationship with a landscape, rather from detracting from a sense of scientific integrity, adds weight to environmental messages by introducing an element of localised sensitivity to an otherwise globalised, and therefor "supra-individual" (Lugon, 2013: 148), ecological view.

Aerial photographers such as Emmet Gowin (whose work is explored in more detail in chapter two) produce explicitly environmental images enabled by their intimate relationships with the land. As such Gowin can be considered an environmentalist, in so far as his work highlights specific environmental issues at a local level, but this doesn't necessarily mark him as an ecologist, interested in resolving local diversity within a global system of connections and dependencies. Aerial photography belongs exclusively to neither of these concerns but has been instrumental in realising both perspectives, the local environment and the global ecology. Climate scientists are currently faced with the challenge of publicising the causes and effects of manmade climate change, an issue of both global and local significance. Aerial photography of one form or another could have an important role to play in this.

1.5 Aerial archaeology

In his 1969 book “Airborne Camera”, Beaumont Newhall recounts how the American balloonist John Wise spotted geometric earthworks while flying over the Ohio landscape in 1852. On learning that these traces related to ancient ruins, Wise remarked:

> “The appearance of these outlines in the soil shows how the power of vision is increased by looking down upon the earth from balloon height. I made it a point to go over the ground where these figures appeared, but could trace no outlines, although what I saw from above must have been the result of colour in the soil.” (Wise, 1852, quoted in Newhall, 1969: 68)

While balloon photographs were taken of Stonehenge as early as 1906, and aerial photographs of ruins were taken in Italy and the Sudan in the years that followed (Cosgrove and Fox, 2010: 36-37), it wasn’t until the aftermath of the First World War that the revealing capabilities of the aerial view, in conjunction with photography, was widely exploited for archaeology. Returning from the war with insight into aerial reconnaissance and air photo interpretation, O.G.S. Crawford enlisted the help of RAF air photography outfits to map prehistoric sites in the south of England. Crawford noticed, as Wise had before him, how slight disturbances in the soil, indecipherable from ground level, could be clearly seen from above.

1.5.1 The typography of aerial observation

Crawford realised that by waiting for specific environmental conditions certain subterranean remains could be better distinguished. “Shadow sites” become visible when the setting or rising sun hits the landscape from such an angle as to reveal low earthworks. “Crop sites” appear where the colour or growth of crops differs according to the depth and type of soil underneath, revealing the outline of buried ditches or walls even after they have been ploughed over. Differences in exposed soil and even melting snow can also reveal the traces of ancient architecture and agriculture. This “typography of aerial archaeology” (Hauser, 2007: 164), facilitated by environmental changes, remains a key method for archaeological discovery and interpretation (Riley, 1987: 17-40, Bewley, 2003). Crawford, in collaboration with Alexander Keiller, published the seminal book “Wessex from the Air” in 1928. The graphic vertical photographs reproduced in the book drew the attention of the art world (Hauser, 2007: 157) and also demonstrated eloquently the worth of air photography for archaeology, encouraging others to take to the air and develop the methodology further.

Inspired by the work of O.G.S. Crawford, Major George Allan – an aerial photography enthusiast of independent means – developed his own methods for surveying the ancient landscapes of southern England. Hauser describes how the oblique angles used by Allan brought a new dimension to aerial archaeology, both descriptive and poetic:

> "This resulted in an oblique image, rather than the vertical shots – much better for mapping purposes – that were taken for *Wessex from the Air*. Allan's technique was novel; but the results are stunningly beautiful." (Hauser, 2008: 85)

Hauser goes on to highlight the narrative aspect of some of Allan's photographs, such as where a steam train and solitary motorcar unwittingly cross paths with unseen Iron Age ditches in an image that tells a story of modern everyday living among "traces of the past" (Hauser, 2008: 86). Allan's handheld camera allowed him more creative control of the views which he selected and the foreshortened oblique angles which he worked with led to more humanised vision of the landscape. Allan's approach in particular foreshadowed the adoption of aerial photography as an art medium in itself. Some prehistoric sites are spectacularly well suited to photography from the air, as Deuel comments of the famous Nazca drawings:

> "If any prehistoric feature ever cried for the aerial approach, it was the desert pictographs of southern Peru." (Deuel, 1969: 232)

The features of the Nazca plains referred to by Deuel had been studied extensively from the air since Paul Kosok first recognised their sophistication in 1941. Among the many prominent aerial photographers who have visited the geoglyphs, Marilyn Bridges was the first to immortalise the drama and character of Nazca landscape. Bridges' work, which chronicles an intimate relationship with such prehistoric monuments, is explored in more detail in the next chapter.

1.5.2 Visualisation beyond vision

Meanwhile, other pioneers were finding increasingly sophisticated ways to stretch the revealing qualities of the new technology. Among them the French missionary, airman and photographer Antoine Poidebard was developing new techniques for spotting and recording archaeological remains in the Middle East. Deuel describes the impact that Poidebard had upon the emerging field of aerial archaeology.

> "[H]e never tired of testing various filters, lenses and cameras […] While sober British workers had espoused the principle that the human eye sees as much as the camera, […] the French priest was in this respect more sophisticated. Indeed he deserves to be ranked among the pioneers of infra-red photography." (Deuel, 1969: 101)

The methods of aerial archaeology in use today are comprised of both the "typography" of direct observation techniques promoted by Crawford, alongside the technologies for extending human sight that were foreshadowed by Poidebard's experiments. Reconnaissance from light aircraft remains a key method for the discovery and interpretation of archaeological remains, although waiting for the right conditions, such as the drought necessary for some crop marks to appear, can make these observations a slow process (Bewley, 2003: 276). Alternative technologies can take information that is unavailable to the human eye - because it lies outside of the visible spectrum or is otherwise obscured by vegetation for example - and visualise it in such a way that it can be later interpreted by a human observer. With multi-spectral imaging this is simply a case of shifting an invisible image, usually from the infrared which is sensitive to healthy vegetation, into visible wavelengths. Airborne lidar is capable of sampling detailed topography without distracting colour information and in the right conditions can even "see" the ground surface through tree cover. This non-visual data also needs to go through a process of data visualisation so that it can be interpreted by a human observer. To make this topographical data easier to read for example, a hill-shade filter is often applied so that the topography looks as if it is illuminated by a direct light source. This method if favoured because it is "easy to compute and easy to interpret" (Kokalj et al., 2011: 263). Hill-shade emulates that way that topography is likely to appear in the real world, illuminated by the sun for example, at the expense of clarity in certain features from certain angles. Kokalj et al. (2011) propose an alternative visualisation technique that reveals omnidirectional details more clearly by emulating diffuse ambient light instead of direct light. The importance of this type of *naturalistic* data visualisation is that the mapping of features in aerial archaeology is achieved by a manual process of interpretation. Interpretive tracings are drawn by hand on top of gathered data which distinguish between natural and manmade features and attempt to categorise these. Successful interpretation comes with experience and interpretive tracings may differ between interpreters. Bewley (2003) argues that, despite advances in the technology for gathering aerial archaeology such as lidar and remote sensing, the process of interpreting, categorising and mapping gathered imagery and data remains an important area of research.

1.6 Drones and remote sensing

Following World War Two the U.S. came to the forefront of military reconnaissance technology, largely driven by the demands of gathering intelligence within the secretive Soviet Union during the Cold War. A new generation of spy planes provided photographic reconnaissance from ultra high altitudes making them difficult to detect. Despite their high altitudes these manned reconnaissance missions were not without risk. In May 1960 a U.S. Lockheed U-2 spy plane was downed by a Soviet surface-to-air missile after it was wrongly assumed that the Soviet Union did not have sufficient radar technology to track such flights. The pilot, aircraft and reconnaissance equipment were all recovered by the Soviet Union in an event that had considerable political fallout.

At this time the U.S. was already developing the first remote sensing satellites, which had fewer risks compared to manned espionage missions. Deployed in secret, these spy satellites recorded images onto film negatives which were then ejected back to earth where they were recovered, processed and used for mapping and intelligence gathering (Kurgan, 2013: 44). The results of these early tests proved promising and since then an ever increasing constellation of remote sensing satellites has transmitted a stream of images back to earth. While some of this imagery is now publicly available - such as data from the Lansat and SPOT satellites - priority is still given to government intelligence gathering. Cosgrove and Fox point out that where the public currently have access to satellite imagery of resolutions up one pixel per meter, the U.S. Central Intelligence Agency have launched and operated satellites estimated to be able to capture up to one pixel per ten centimetres (2010: 73). Similarly, advances in unmanned suborbital aircraft - often driven by military interest - have been later adopted for civilian purposes.

1.6.1 Narrativisation of surveillance warfare

Despite their sophistication, surveillance satellites are limited by their orbit patterns and can be rendered useless by cloud cover. To mitigate these shortcomings, unmanned drones - that could fly targeted missions beneath cloud level - were developed in particular by Israel and the U.S. (Gusterson, 2016: 10-11). First developed for surveillance, from 2001 these drones were also fitted with missiles that could be engaged remotely. The deployment of weaponised drones has been subject to much controversy, in part because the “asymmetrical” (Chamayou, 2013: 162) nature of drone combat is closer to assassination than warfare and as such raises complex ethical issues. On top of this drone operators have repeatedly misidentified targets leading to civilian casualties. It has been suggested that this is because the placement of drone pilots well out of

harm's way leads to apathetic or uninformed decision making. The implication here is that the intervention of technology removes the drone pilot from the heat of the battlefield. A lack of immersion perhaps means that operators are not engaged with activities on the ground on a personal level and are therefore unable to take their moral responsibilities seriously. Contrary to this view, Gusterson suggests that:

> "This distanced voyeurism is counterbalanced by a sense of immersive intimacy when drones patrol the same terrain over and over and operators come to feel they know the people below." (2016: 64)

This is backed up by a number of accounts from drone pilots who are emotionally affected by their remote "experiences", leaving psychiatrists to reassess the possibility of post traumatic stress disorder in those who have never been in danger. Gusterson goes on to describe how this sense of intimacy can itself be the source of human error as it leads operators, believing in their perceived closeness to activities on the ground, to extrapolate information that is in fact unavailable to the aircraft's sensors. In a bid to collapse the distance from the terrain on screen the drone operator sees a projection of their own constructed narratives in the aerial images, rather than forensically judging the evidence in front of them as one might do studying a map (2016: 64-70). Why these assumed narratives repeatedly result in the false identification of enemy targets will remain hotly debated. It is interesting that, in Gusterson's version of events, even before weapons are deployed the act of seeing is not a passive but an active one, where events are constructed in the mind of the drone pilot. This is made possible by a perceived experience of embodied flight above the battlefield, even from a remote control centre thousand of miles away. While those who criticise the use of drones in warfare are concerned that their automated and distanced nature reduces well informed decision making, Guterson suggests that it is active human bias, not passive reliance on technology that leads to lethal mistakes.

While the remote sensors used by military agencies might be technically impartial the very act of viewing these images is a highly politicised one, even for a trained drone operator. Surveillance images can only be meaningfully read by those with an understanding of the capabilities and limitations of the imaging technology. Military aerial survey images have in the past been published in order to sway public opinion despite the fact that many images are difficult to interpret even for experienced experts, a testament to the persuasive power of the image. For Laura

Kurgan, the opaqueness of these images is masked by a perception that they are “scientific and objective” (2013: 31):

> “[...] because the interpretation of such images is an art, as well as a science - because it inherently involves imaginative leaps - the putatively scientific and objective interpretation at the service of governments and commercial institutions tell only *a* story, not *the* story, of what is going on in these images.” (Kurgan, 2013: 31, original emphasis)

What remote sensing technology *can* do is uncover the evidence of environmental and humanitarian issues that are difficult to visualise otherwise, particularly where access is restricted, such as within the borders of a secretive state. What remote sensing *cannot* do however is promise a rational or objective method for understanding these events. In fact the distanced nature of the views available by remote sensing encourages a politicised “narrativisation” of events on the ground, as the viewer attempts to mitigate the lack of information on the basis of their own grounded experience. This narrativisation can be useful to the aerial photographer who has a story to tell - and is indeed critical to the appeal of many aerial photographs - but may be a dangerous thing in a war zone.

1.6.2 Civil applications of drones and remote sensing

Despite being largely associated with military and other government applications, remote sensing technologies - both high-end and low-end - have been adopted by a broad range of civilian and scientific fields. At the high-end, the interpretation of publicly available data from remote sensing satellites is now an established methodology in the earth sciences. These scientists use satellites that are specifically designed to gather data for civic and commercial use, such as NASA’s Lansat or the French SPOT programme, along with declassified historical imagery from military reconnaissance satellites and other sub-orbital aircraft. Data is gathered using visible light (photographic) sensors alongside multispectral imaging, radar and lidar to build a more complete picture of the composition and form of the landscape being studied. Scientific investigation carried out using these methods can be applied to human and natural resource management, along with other fields across biology, sociology and physical geography.

Despite the technological nature of this methodology, human observation and interpretation of the aerial images have a central role in remote sensing science. Successful interpretation relies not only on a theoretical understanding of the technology and of the forces at work in the

landscape being observed, but also upon individual, grounded life experience both in the lab and in the field (Jenson, 2007: 5-6). This tacit learning, according to Jenson, “cannot be measured, programmed, or completely understood” (2007: 5). Just as state sponsored aerial reconnaissance is vulnerable to human bias facilitated by the “leaps of imagination” necessary to interpret aerial imagery (Kurgan, 2013: 31), so the scientific use of remote sensing is dependent on a human component, and perhaps a similarly increased potential for politicised bias. At best the satellite view, devoid of political borders, might instil a sense of stewardship in the scientific community as Kurgan suggests (2013:113), particularly as remote sensing technology can provide such a powerful tool for visualising environmental issues.

Low-end unmanned aerial vehicles (UAVs) bear little resemblance to their high-end, military counterparts (despite both being referred to as “drones”), and have become readily accessible to both hobbyists and professionals looking to exploit the new technology. Lightweight UAVs are used for low level photography and multispectral imaging in areas such as archaeology, agriculture and environmental science (Remondino et al., 2011: 2). The advantages of these aerial platforms over the manned aircraft solutions historically used in these fields include their low cost and the high spatial and temporal resolution of the data gathered. Particularly when combined with software-driven photogrammetry, low-end UAVs are a powerful tool for monitoring small scale areas of landscape. The democratisation of these technologies promises to open up the field of mapping to a broader range of stakeholders, although it is yet to be seen exactly how the use of UAVs will be regulated from country to country (Remondino et al., 2011: 5). Given the history of the aerial view’s perceived association with geopolitical “sovereignty” it seems unlikely that this democratisation of airspace will continue without resistance from some authorities.

1.7 Summary

Aerial photography is a technologically enabled image-making process. As such it entertains a Modern ideal where technology extends human capability, and in doing so elevates us from our personal, local perspectives. At the beginning of the Twentieth Century, against a background of wartime surveillance and modernisation projects, aerial photographs could have become emblematic of authority and privilege, serving only the ideals of globalisation and rational order. Instead “air mindedness” was mediated by the individuality of the heroic aviator (a legacy of the previous age of ballooning) and the local insights that it offered.

Now, at the beginning of the Twenty First Century, remote sensing and unmanned drones have afforded a new wave of unprecedented access to aerial images. Just as the relation between aerial photography and aerial bombardment in World War One and Two made the technology a "superb seeing weapon" (Chmielewska, 2013: 232) so the weaponization of drones in the Twenty First Century has again given rise to narratives of warfare and voyeurism associated with aerial vision. These ideas are again mediated by the "heroic" endeavours of individuals, this time the enthusiasts, entrepreneurs and scientists who have adopted and adapted drones and remote sensing technology for civilian, cultural, environmental and humanitarian purposes. Now, just as a hundred years ago, we view aerial surveillance with conflicted sentiments of awe and mistrust. It could be argued that a mode of vision that - like Jeremy Bentham's Panopticon - elicits power to a few, has liberated the worldview of many. Throughout this chapter we have seen how even the most instrumental of aerial photographs have taken on a cultural life of their own, often challenging the presumptions of the progressive ideology which made them possible in the first place. Such photographs retain their locality despite their altitude, resisting the politics of globalisation and unification with which they have been aligned. The aerial view has also been wrongly assumed to represent a scientific impartiality. According to Haffner the technological nature of such optic tools apparently "offered a means of removing the bias of oneself and one's senses from the object of study" (2013: 24). Behind this "scientific endeavour" however lies "a complex set of political and social concerns" (Haffner, 2013: 22). On top of this the embodied experience of flight has, until recently, largely been omitted from the discourse of aerial photography. This personal experience might feed into the "instrumental" aerial photograph implicitly, or more explicitly in the case of aerial photographers such as Walter Mittelhotzer who set out to tell a story in the images they produce, as Lugon explains:

> "Mittelholzer's practice demonstrates to what degree the aerial view has also the capacity to be embodied, autographed, individualised and truly steeped in an imaginary of adventure, sporting feat and transcendence. The image produced is not only technical and organised, but also physical and irrational." (Lugon, 2013: 148)

The self-ascribed rationalism and impartiality of Twentieth Century modernism were influenced by a post-colonial assumption of the superiority of Western thinking, which prioritises the apparent objectivity of vision and the image over the nuances of lived experience. The aerial view has played a significant part as both cause and effect of this ideology. Despite this it seems impossible to separate lived experience from the aerial image. A tendency for the aerial view to return to

familiar experience has been seen throughout the examples in this chapter; from the prevalence of the oblique view over the more cartographic vertical, to the military drone operators who felt bodily immersed in flight above the battlefield. Aerial photographs require an active "narrativisation" to triangulate familiar ground-based experience with an unfamiliar perspective. This activity brings out the tension between the distance from the subject and a sense of intimacy that is based on prior experience. The following chapter will expand upon this aspect of the aerial view in particular - its relation to the imagined sensation of flight and a personal relationship with the landscapes below - by studying artists and photographers like Mittelholzer who have exploited this potential for "irrational" resistance in the technological image.

Chapter 2 - Aerial artworks: Creative responses to the experience of flight

2.1 Introduction

The previous chapter explored how military strategists, rural and town planners, ecologists and archaeologists adopted the technologies of photography and flight that came about in the early Twentieth Century. It was shown that so called “air mindedness” was driven not only by a romanticism towards the heroism of flight but also by a type of vision that was connected to the Modern and globalised worldviews of the Twentieth Century. This chapter will expand upon how the aerial view operates as a *mode of vision* and will consider its relationship with the visual arts. Aerial photography was deemed a powerful tool for modernisation because of its cartographic usefulness. This is to say that the aerial view appeared to represent terrain in a rational way devoid of the localised perspectives found for example in the site-specific landscape panorama view. Such delocalisation could be tied to the rational and increasingly global worldview of Western modernism. In practice aerial photography resists such classification and - as was suggested in the last chapter - tends to remain localised and personalised. This chapter will show how creative applications of the aerial view offer the possibility of personal perspectives that can be embodied, intimate, and aesthetic.

It has been claimed that access to air travel and the resulting aerial perception were a major influence upon the Cubist painting tradition. It is easy to see how the vertical view in particular, void of horizon and abstracted from the perspectives traditionally adopted by linear perspective, can be related to the aims of Modern art movements which strove to deconstruct the representative image. Saint-Amour questions the ascribed significance of the shared visual syntax of Cubism and the vertical view - on the surface both collapse depth and details into a synoptic whole - instead proposing that the common denominator is “a new kind of observer” (2003: 354). While the aerial view is often associated with a passive gaze, Saint-Amour suggests that the challenge of the air view is that – as Cubism does - it requires *active* observation. Castro agrees that seeing the world from above is an embodied activity and adds that it is intrinsically connected to the sensation of free movement:

> The feeling of flight is as central to the aerial view as is the enjoyment experienced in observing the earth from an unusual point of view or of visually discovering and dominating it. (Castro, 2013: 118)

While the elevated viewpoint places the viewer as an outsider to the local world, unlike in cartography the observer remains located in a specific point in space above the landscape. Both Castro and Saint-Amour suggest that the aerial view is encoded in such a way as to invite, even require, an active imagination of embodied flight in order to decode the landscape below. In this chapter it will be suggested that tensions between the distance and intimacy of flight add to the intrigue of the aerial view. Artist-photographers have exploited the conflicting ways in which the air view miniaturises landscapes, so that they appear almost within grasp, while at the same time distancing the viewer from the earth's surface.

2.2 Modern painting and the aerial view

Writing in the final 1937 issue of AXIS, a quarterly journal of Modern painting and sculpture, John Piper remarks on the novelty of the vertical photographs of prehistoric England published in Crawford and Keiller's *Wessex from the Air* (1928). In his astute and timely insight into early Twentieth Century air mindedness Piper states:

> "Flying (whether we do it ourselves or not) has changed our sense of spaces and forms and vistas enormously. […] The significant thing being that from the air *horizons vanish*." (Piper, 1937: 5, original emphasis)

According to Piper it was no coincidence that the availability of this view coincided with a time when the horizon was losing its significance in landscape painting, as artists moved from representation towards abstraction. Piper stops short of suggesting that one was causally linked to the other, instead implying that both aviation and abstract painting stem from a "new consciousness" that came around the turn of the Twentieth Century (1937: 5). Perhaps it reveals a certain degree of optimism during the interwar years that Piper doesn't mention the pivotal role of the First World War in the development and dissemination of the aerial view. Saint-Armour considers that this romanticised view of a providence and destiny shared by aviation and abstract painting was widespread during the Twenties and Thirties (2003: 349-350).

There is an evident correlation between the appearance of the aerial view and some forms of Modern painting. Cubism, for example, tends to reduce three-dimensional depth into a clear geometric order. Similarly abstract painting can be related to a cartographic collapsing of the vertical dimension (MacArthur, 2013: 203-206). Beyond such observations it is difficult to make a general association without overlooking the nuances and unique inheritances of both visual

modes (Saint-Armour, 2003: 352). This section will instead consider Modern artists who have dealt more explicitly with the aerial view and consider their creative responses to the experience of flight in particular. This is by no means an exhaustive account of the extensive history of the aerial in Modern painting. Notable omissions include Sydney and Richard Carline - official War Artists during World War One - as well as Kazimir Malevich, Susan Crile, Jane Frank and Nancy Graves. Contemporaries of these artists have been selected here as examples that support the claims of this thesis. The aim is to highlight key themes and to demonstrate the emotive and aesthetic possibilities of the aerial view.

2.2.1 Tullio Crali

Italian Futurists, preoccupied with the revolutionary speed and efficiency of modern technology were attracted to aviation both as a way of seeing and as a subject of painting. The sub-genre of "aeropittura" (aeropainting) was outlined in a 1929 manifesto which stated that the air view represented a fundamentally new reality, unobtainable from the ground (Smiles, 2015: 80). For the Futurists such a view coincided with their socio-political ideals. Crali's 1938 "Upside Down Loop (Death Loop)" demonstrates a radical departure from the grounded perspective, its wide field of view encompassing both the (upside down) horizon and the vertical axis. The motion of the airplane is described in the lines that flow vertically, linking what appear to be multiple aspects of the city seen during a rolling motion into a single vertical panorama. At the same time the city transforms from an oblique landscape view to an ordered plan. Here the technology of flight is revealing and also brings order to the buildings below. In the previous chapter aerial photographs taken for various instrumental purposes were shown to implicitly convey a narrative of modernist ideals. For the Italian Futurists the connection between a political worldview and a visual mode was clearly stated. The vertiginous paintings of Crali and his contemporaries are deliberately disorientating. They aim to deconstruct traditional ways of seeing and reconstruct the world under a new mechanism of rational order, where technology displaces nature (Cosgrove and Fox, 2010: 32-33). The ideals of the Italian Futurists are in part shared by the broader projects of early Twentieth Century modernism but have also been aligned more specifically to the goals of fascism and its desire to create a new social order. Even in Britain an association existed between fascism and aviation as Gruffudd notes: "Whilst the Left had its heroes of the air, the Right's infatuation with speed, power and the machine embraced the aeroplane more fully" (1991: 20). The aeropaintings are intrinsically political, their message told analogically through the sensational experience of flight.

2.2.2 Paul Nash

Paul Nash was appointed an official war artist by the British government in both World War One and World War Two. His work tells the human story of the war through landscape, but it is also deeply personal. Through surrealism Nash depicted scenes with no separation between the physical world and a mythological world of dream and imagination. Surreal depictions of the First World War landscapes appear like dreamscapes, analogous to Nash's emotional state, that quickly became "nightmarish" as the war progressed (Grant, 2003: 39-42).

While Nash's earlier work focuses on the inhumanity of warfare, the images that he produced during World War Two were also intended as anti Nazi propaganda (Hall, 1996: 7). Like Crali's, these paintings are politically loaded, in this case depicting the heroism of British forces in the face of fascism. Nash's paintings also carry a psychological meaning, their sense of chaos and claustrophobia representative of the artist's own anxieties heightened in the context of war (Hall, 1996: 21). Nash suffered from severe asthma that prevented him from ascending in an airplane himself and prematurely ended his life in 1946. His own ill health played upon the themes that resound in his painting during World War Two. These are in sharp contrast to the "playfulness" and "comedy" evident in the aerial paintings of Nash's contemporary, Eric Ravilious (Gruffudd, 1991: 23). Rather than formally representing the physical landscape these images offer a glimpse of the emotional interpretations of the artists. For Nash the world above was chaotic and dangerous, reflecting his own personal fears as well as the horrors of the first truly airborne war.

2.2.3 Peter Lanyon

Many early Twentieth Century Modern artists like Nash remained grounded spectators of the visual transformations of aviation - although Crali was himself a pilot - painting largely imagined views representative of their political and emotional narratives. During the 1950s Peter Lanyon began painting abstract landscapes drawing directly on his own experiences as a glider pilot. These images are a response to the bodily sensations of flight, allowing Lanyon to explore "his own physical and emotional experience of flight" (Garlake, 2015: 62). The paintings are part geographical and part gestural, affected by the atmosphere and movement of the aircraft as much as by the landscapes and seascapes that Lanyon flew over. Beyond this there is an engagement with the feeling of flight that is highly personalised. In images such as *Soaring Fight* "the presence of the artists body", says Garlake, is "strongly implicit" (2015: 62). In this regard Lanyon's work focuses on the boundary between body and environment. Lanyon's description of his process of painting could equally describe his experience of flying:

> "[...] I am led to explore the region of vertigo and of all possible edges where equilibrium is upset and I am made responsible by my own efforts for my survival. [...] The junction of sea and cliff, wind and cliff, the human body and places all contribute to this concern." (Lanyon, 1962: 4)

The disorientating vertigo of his compositions heightens these tensions in a way that is personally affective. Similarly to his predecessors, Lanyon was interested in the aerial view as a device to break away from conventional ways of seeing and representing landscape. Where linear perspective demands that landscape is represented receding towards a horizon from a single fixed viewpoint, the language of Cubism that Lanyon drew from allowed for the multiplicity and movement experienced in flight. What sets the glider paintings apart from other aerial artworks is their visceral nature and a sensitivity to the embodied interactions with the dynamics of the low atmosphere that are necessary for unpowered glider flight. While Lanyon achieves this through abstraction, similar personal responses to the experience of flight have also been tackled in more representational artwork.

2.2.4 Yvonne Jacquette

As commercial air travel became more widespread in the late Twentieth Century so the scopic possibilities it provided became embedded in Western culture. To avoid the turbulence of low altitude and to improve commercial viability, aircraft became larger and were pressurised in order to fly at high altitudes. In contrast to the aesthetics of speed and instability first associated with aviation, the experience of air travel now is more associated with a calm detachment from landscapes far below.

American artist Yvonne Jacquette is known for her paintings, prints, and drawings of aerial views seen from skyscrapers, light aircraft, and commercial airliners. Her work focuses on the perceptual experience of landscape that flight allows. The paintings give the impression of a moment in time captured in an ever-changing scene (Berkson, 2002: 27-28). Movement is sometimes represented by multiple views as the aircraft circles around the same location, a format also used by aerial art-photographers such as Patricia Macdonald and Bernhard Edmaier. Jacquette's landscapes are figurative with recognisable features painted from the oblique view, resulting in images that are relatable despite their distanced viewpoint (Dreikausen, 1985: 22). Here the aerial is explored as a mode of vision that reveals a realistic depiction of landscape in terms of emotional and aesthetic realism, rather than cartographic accuracy.

Night Wing: Metropolitan Area Composite includes the wing of the airliner in the painting's composition. The closeness of the aircraft emphasises the distance of the city scene below. This tension between the immediacy of flight and a detached gaze that it offers is intrinsic to the aesthetic of air travel. Like many of Jacquette's paintings, *Night Wing* is rendered in pointillistic brushwork reminiscent of Aboriginal art. Just as Aboriginal paintings that correspond to landscapes are less a cartographic representation and more a symbolic reference to the narrative of Dreamings (Fox, 2009: 292-293), similarly paintings like *Night Wing* are dream-like interpretations. Their representational appearance works as a platform to infer an abstract story of the metropolis viewed from the detached state of the - metaphorical - air view.

From the Italian Futurists to contemporary Modern artists such as Jacquette, the aerial view has been explored as an alternative to traditional modes of vision in landscape painting. These creative responses have exploited the sensations as well as the visual format of flight, and reflect the politics, emotional psychology, embodied experience, and surrealist dreamscapes of the artists. A similarly diverse range of artwork has been produced by artist-photographers who have adopted the aerial view.

2.3 Aerial art-photography

The previous chapter explored a range of ways in which aerial photography is used instrumentally, for the purpose of survey, surveillance, or documentation for example. Such images have played a significant part in art history despite their instrumental nature (Weems, 2011: 229). As we have seen, the air mindedness that came with the availability of aviation and aerial photography has made a significant impression on visual culture, such as in its correspondence with Modern painting. This section will examine a number of artist-photographers who have adopted aerial photography more directly as an art medium. While these photographers use much of the same technology and methods as those mentioned in the last chapter, their concern with story and meaning will be the focus here rather than function or accurate representation. No photograph operates as an objective record. Where this fact is overlooked or mitigated for in other fields, creative practice actively exploits the personal and political in photography. As Lanyon puts it:

> "Art is often confused with imitation. A photograph is thought to be an accurate picture of reality. This attitude forgets that the camera was derived from a vision constructed by artists." (Lanyon, 1962: 4)

Artist-photographers have taken the aerial view beyond its documentary utility and employed it as a platform for personal expression and experiential observation of landscape. As in the previous sections the artists included here do not represent an exhaustive catalogue of aerial artist-photographers (among the many notable omissions are William Garnett, Michael Light, and Bernhard Edmaier) but instead demonstrate what creative applications of the aerial view can achieve through a selection of examples.

2.3.1 Margaret Bourke-White

While studying at Columbia University, USA, in the early 1920s Margaret Bourke-White took an elective at the Clarence H. White school of photography where she received formal training in photography (Goldberg, 1989). After graduating she launched herself into the art photography world and rapidly forged an identity and reputation through her photojournalism of industrial America. Her photograph of Fort Peck Dam was used on the cover of the first issue of LIFE magazine in November 1936. Working on commercial assignments for airlines provided the opportunity to photograph from the air and in 1952 Bourke-White produced a portfolio of photographs taken by helicopter, published in LIFE under the title *A New Way to Look at the US*. The helicopter, still in relative infancy in 1952, afforded views that were closer and more precisely placed than those the airplane could provide. Bourke-White used this freedom of movement to full effect, photographing down the axis of the Golden Gate Bridge with perfect symmetry and flying “face to face” with the Statue of Liberty (Bourke-White, 1952: 140).

Bourke-White’s images are journalistic in that they carry a story but they also combine her classical training in composition with her interest in abstracted shape and pattern. Aerial photography is particularly well suited as a medium for exploring the boundaries between three-dimensional representation and abstraction upon a two-dimensional picture surface. Images that depict the scale and repetitiveness of America’s industrial metropolises carry on themes that were established in Bourke-White’s ground-based photographs. Her work shows human stories amongst the inhuman scale of the industrial world.

Where some aerial photos are striking by virtue of their altitude alone, these images use low angles and carefully considered composition, facilitated by the maneuverability of the helicopter. Bourke-White’s photographs are graphically powerful in their own right, the airborne perspective here providing the freedom for her to arrange compositional elements to form an image. These “aesthetic moments”, as Cosgrove and Fox describe them, are over and above any

representational attempt at “documenting the geography of the area” (2010: 102). The compositional possibilities available from the air became an integral part of her photographic arsenal, as they had done to a lesser degree with fellow LIFE photojournalist Wallace Kirkland (section 1.3.1). Callahan notices “there was hardly an assignment Bourke-White undertook in which she wouldn't contrive a reason to find a pilot to take her up for an aerial view” (1998: 143). The value of these aerial photographs is neither their utility nor their novelty. They are an integral part of the body of artistic work that Bourke-White produced during her career. Here the technologies of aviation are an extension of the creative toolkit available to the artist-photographer.

2.3.2 Emmet Gowin

Emmet Gowin is another American aerial photography convert who was first an established artist-photographer before he took to the air. Graduating with a BFA from the Richmond Professional Institute and an MFA from Rhode Island School of Design, Gowin first established his craft with intimate images of family life. His work explores the continuity between the body and nature in portraits often framed as microcosmic landscapes (Reynolds, 2002: 134, 140). In 1980 Gowin flew over the recently erupted Mount St. Helens and subsequently developed a fascination for devastated landscapes, which he photographed from the air. Open-cast mines, military depots, and waste treatment plants are photographed with great sensitivity in carefully developed monochromatic images. For Gowin first hand experience is key. His work functions as a witness and as a process of learning shared by himself and the viewer (Gowin 2002b).

A series of photographs above nuclear test sites in the Navada desert are among few civilian photographs ever taken over the restricted area. Raking sunlight picks out craters and vehicle tracks with a delicacy that is in sharp contrast to the destructive forces evidenced in the photographs. Gowin approaches these sites like scars on a body, an analogy that crops up often in analysis of his aerial work. Both his portraiture and landscapes are involved in the telling of emotional stories, which are full of meaning to the artist. While these are undoubtedly personal observations they are told with a rawness and integrity to first hand experience that makes them easy to relate to. Despite their environmental themes (mentioned in section 1.4.3) it is clear that these images are not intended as rhetorical devices but more as witness to a landscape as it appears to the artist both physically and emotionally. That is not to say that any artwork - in fact any image - can ever be entirely apolitical, but that Gowin makes his core business that of observation.

To Gowin the aerial view is a way of seeing that he was predisposed towards even before he first took to the air (2002b: 152). His horizonless verticals in particular have the same sense of looking into a microcosm as do his intimate photographs of people. This could be related to the sensitivity with which Gowin approaches his subjects. Few other artists have used the aerial view - which could as easily represent a harsh, even brutal, gaze - with such emotional sensibility. Among his contemporaries, Marilyn Bridges' photographic treatment of ancient cultural landscapes also stands out in this regard.

2.3.3 Marilyn Bridges

In 1976 Marilyn Bridges took a flight in a light aircraft above the Nazca lines - a group of prehistoric geoglyphs in Peru - as part of a photographic assignment. She was so taken by the impact of seeing the ancient site from the air that despite her fear of flying she returned to build a portfolio of aerial photographs both in Peru and at many other prehistoric sites around the world. The sense of awe and respect for the ancient architects that impacted Bridges during her first flight above the Nazca lines became a central theme of her subsequent work:

> "I felt as though I was in the presence of a great force, a force which provided unity, that challenged the narrow perspectives of our lives by requiring us to step back enough to view the whole." (Bridges, 1986: 103)

The prehistoric sites that Bridges works with often survive as ephemeral earthworks that are only legible from the air. As in aerial archaeology, sunlight at a low angle can reveal features and it is under these conditions that Bridges prefers to work. Her interests are very different from those of archaeological aerial survey however (Goldberg, 1990: 10). When in 2004 Bridges traveled to Turkey to record ancient sites endangered by the Iraq War, the resulting images document a personal impression of the landscape as much as they did the physical state of the remains (figure 2.1). While Bridges shares the concern of archaeologists who recognise the urgency of recording heritage sites at risk, she is also concerned with what is missing from the conventional archaeology report.

Figure 2.1 - Marilyn Bridges, “Boulders and Byzantine Ruins, Herakleia under Latmos, Anatolia”, 2004. © Marilyn Bridges, used with permission.

Goldberg describes Bridges’ work as “forging a peculiar bond of intimacy with resistant subjects” (1991: 7). This intimacy is achieved in part by flying at relatively low altitudes and carefully planning around the best times of day for flying – in order to achieve long, delicate shadows for example - to better reveal topographic details. Beyond this there is a personal relationship to the landscape that is expressed through the creative freedoms and sensations that the aircraft provides. Bridges says:

> “I am not up there photographing strictly for documentary purposes. I try to express what it is that I’m sensing in the air. [...] I am up there to *experience* the site. And I hope to communicate that experience through photography.” (2006: 67, original emphasis)

To Bridges the aircraft is an extension of her bodily experience, and a way of sensing the landscape as well as a photographic platform. As such her *multisensory* experience is channeled through the purely *ocular* vision of the photograph. This is made possible by the cultural context of viewing images that are rich in meaning. Bridges’ photographs carry an overarching narrative

of human interaction with the land. The relationship between the modern day observer and the landscape is juxtaposed with that of the architects of the monuments photographed. The strength of Bridges' work is that it charts our impact on the land with both visual clarity and an emotional sensibility.

2.3.4 Georg Gerster

Where Bridges prefers to photograph from as low as is possible from manned aircraft, bringing the observer closer to the landscape, Georg Gerster prefers the abstraction of the high altitude view. Gerster often flies as high as aircraft and visibility allow, even photographing from commercial airliners. His images celebrate the patterns and forms that are unavailable from the ground and are almost always vertical, not oblique. While he has photographed specific landmarks, including ancient heritage sites around the word, much of his work depicts otherwise unremarkable landscapes that become strikingly graphic from above. Gerster sees the process of aerial photography as one of discovery, exemplified when he happened across the visually striking village of Labbézanga during a flight above Mali.

From the air the village is delineated by an interplay of geometric and organic shapes - like strings of beads - in an image that is both visually pleasing and poetic. Gerster embraces the "serendipity" by which such photographs come about. His process is one of discovery rather than invention. The viewer is in turn afforded a similar sense of discovery as they decode the abstract appearance of the images and decipher the landscapes pictured. Here the aerial view is a mechanism to reconsider the ordinary, to "scratch off" the "habit" of the everyday that "covers the world like varnish" (Gerster, 1985). Where other photographers strive to visually connect the aerial to grounded experience, by including human figures where possible for example, Gerster's vertical views attempt to make the familiar strange.

2.3.5 Yann Arthus-Bertrand

Beginning his photographic career as a journalist, Yann Arthus-Bertrand increasingly specialised in aerial photography in the 1980s and 90s, and became internationally renowned thanks to his UNESCO funded project *Earth from Above*. The project, which was intended to document the state of the earth, was published in 1999 selling over three million copies in book form and touring globally as an open air exhibition the following year. Arthus-Bertrand went on to direct the 2009 film *Home*, in some respects a moving incarnation of *Earth from Above* with a more overtly environmental message. Avoiding hypocrisy, both projects were carbon offset to mitigate the

emissions from the helicopters that Arthus-Bertrand prefers to use for photography. As well as the free public exhibitions of both projects, *Home* was also made freely available to stream online.

The immense popularity of Arthus-Bertrand's work is related to his journalistic sensibility. The aerial photographs tell unambiguous stories about the way of life of peoples around the world, our relationship with the natural world, and the impact of human activity upon on it. Despite the abstract nature of many of the landscapes photographed, Arthus-Bertrand - unlike Gertser - seldom focuses on abstraction alone. Instead his images remain narrative and relatable. One of the devices Arthus-Bertrand uses to achieve this is to include a point of reference in an otherwise scale-less scene. This is sometimes another aircraft, boat or animal, but more often a human figure. In some wilderness areas an assistant has been landed by helicopter into the scene in order to provide scale.

The inclusion of the figure does more than enable an approximation of scale. It marks the scene as a relatable, inhabitable part of the world that - despite its extreme appearance - the viewer could themselves visit. Similar to the narrativisation described in the last chapter, this requires a leap of imagination by the observer to connect their grounded experience with the distant expanse visible from the air. By such means Arthus-Bertrand explicitly plays on the tension between the strange and the familiar that is almost always present in the aerial view.

2.3.6 Patricia Macdonald

Scottish photographer Patricia Macdonald uses aerial photography to illustrate environmental narratives, in what she described as an "editorial" context, as well as explicitly as an art medium. Drawing from a background in both the visual arts and environmental science, much of Macdonald's work draws attention to issues of land use that are made visible in the landscape. Of particular interest is the extent to which land which is considered to be wild or natural is in fact the product of cultural processes. Such themes are central to Macdonald's collaborations with bodies such as Scottish Natural Heritage, and are also the subject of photo-artworks. The series *This is not a natural wilderness: and it is not a picture of a natural wilderness either* narrates how extensive land management has transformed the Scottish uplands, reducing natural biodiversity in favour of monocultures. Macdonald's scientific awareness of her subject matter affords the work a rare combination of aesthetic and non aesthetic concerns.

Macdonald is also fascinated with flight itself and acutely aware of the legacy of the aerial view in visual culture. While acknowledging that the aerial view affords an apparent "comprehensiveness" that can provide a "useful and inspiring" vision in an editorial context, Macdonald asserts that this totality is an illusion where in fact the "god-like" mode of vision is only "partial" (Macdonald, 2004: 53). She goes on to state:

> "It may be a dangerous delusion if the process of 'drawing back' results in a loss of human awareness of those things that may only be appreciated from close to, or when 'grounded' or 'immersed'." (Macdonald, 2004: 53)

While the view from above appears to abstract from human experience - in Modernist terms providing an objective platform to observe the subject below - Macdonald makes it clear that this facade accounts for only part of aerial vision. Her artworks aim to use aerial photography to explore the relation between an apparent rational "comprehensiveness" on one hand and a more subjective, organic, and irrational vision of landscape on the other (Macdonald, 2005: 93). In composite pieces like *The Play Ground series, No. 6: Burnt Moorland: Grouse Shooting* (figure 2.2) the relationships between components form a significant part of the overall image. This is particularly fitting where the piece represents the ecosystem of connections within landscape; in this case between the hunted grouse and the hunters, the moorland and land management regimes. For Macdonald, *Burnt Moorland: Grouse Shooting* comprises both the Cartesian grid favoured by the visual language of Modernism - made up by the frames of the composite - contrasted with the swirling "non-linear" motion visible in the relation between the photographs (2005: 93). She describes the perceptual framework of her artwork as belonging partly to the paradigm of Modernism and partly to a Postmodern paradigm.

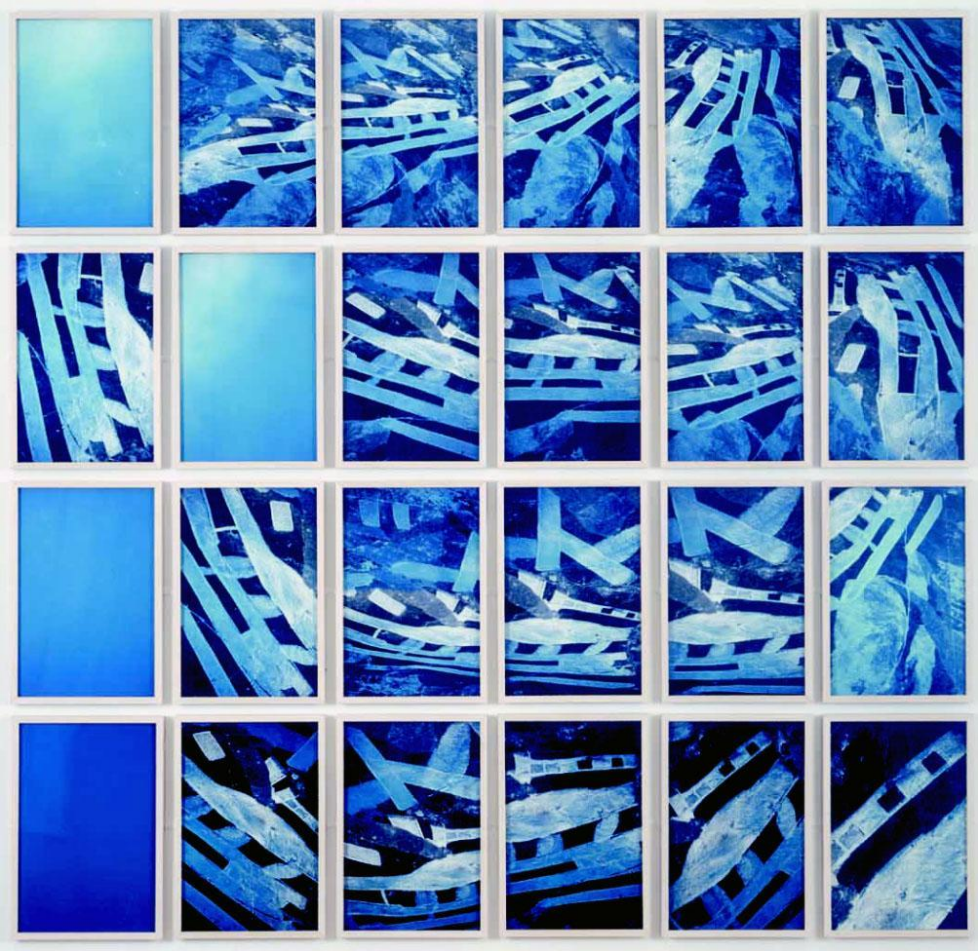


Figure 2.2 - Patricia Macdonald, The Play Ground series, “No. 6: Burnt Moorland: Grouse Shooting”, 1999. © Patricia Macdonald, used with permission.

The composite pieces show landscape in flux. Some include multiple viewpoints as the aircraft circles around while others - like the *Change of state* series focus on the ephemeral effects of weather, cloud and ice. These images move away from the notion of capturing the landscape in its completeness, or recording it in a cartographic sense, and instead provide a transient impression of different forces at work. From a light aircraft, environmental forces are particularly apparent. Macdonald is herself a pilot (her collaborator Angus Macdonald flies during photography) and is acutely aware of the vulnerability of low altitude flight. The visceral noise, temperature, and airflow experienced in a light aircraft - with the window opened for photography - is rarely apparent in aerial photographs that remain serenely static. This movement and multisensory experience is an important component of Macdonald’s work.

2.4 Summary

This chapter has examined a selection of artists who have used the aerial view in painting and photography as a medium for exploring landscape, and in some cases also as the subject of artworks. While the technologies of flight and photography are much the same as those covered in the last chapter, the intentions behind these images are seldom directed towards instrumental function. Instead there is a concern for the aesthetics of the aerial view, the experiences that it relates to, and its cultural meaning. In the last chapter it was shown that some aerial photographs serve as rhetorical devices that aim to promote the technologies that facilitate them. In a broad sense aerial photography has been aligned to the Modernist ideals that see technology as a means to bring order to the chaos of the natural world. The artists mentioned here, with the exception of the Italian Futurists, show little interest in promoting the technologies of flight and photography to such an end. Instead the specific technical methods employed are often dismissed as simply a convenient platform for artistic vision. Macdonald describes the "god-like" appearance of the aerial view as a "dangerous delusion" (2004: 53). It is the freedoms not the privilege of flight that afford possibilities for creative expression. Far from being mechanised, these artworks are deeply personalised and emotive.

The broad range of recognisable styles and approaches across artists using the same media is testament to this. These artists demonstrate the possibility for the aerial view to be used in a way that, far from being "disembodied, anonymous and abstract", is "embodied, autographed [and] individualised" (Lugon, 2013: 148). The apparent impartiality of the view from above is disrupted by those, like Nash and Jacquette, who in different ways work with dreamscapes that reveal a cartography of personal emotion rather than an accurate representation of geography. Likewise, aerial photographers like Gowin and Bridges chronicle their personal experiences. The resulting artworks are evocative because they represent an emotional reaction to landscape as it is discovered by the artists.

Creative practice also functions as disclosure through disruption, with the capacity to interrupt - and in the process reassess - the everyday. Some artists have used the tensions of scale and distance inherent in the aerial view as a catalyst for this kind of disruption. Flight is outside of everyday experience. The fractured and transient mode of vision it reveals represents a radical shift from the traditions of landscape representation in Western art. A sense of danger and vertigo also serve as interruption from normal, grounded, experience. Lanyon refers to the vitality of such tensions, which he felt in moments of "survival" when piloting a glider in the lower atmosphere

(1962: 4). To Lanyon these vertiginous experiences had the power to reveal new relationships with landscape. Dorrian describes vertigo as the reverse of the sublime transcendence that often accompanies the view from above. Instead of remaining elevated above the surface of the "immensity" below, vertigo draws us into a "groundless" complexity with no surface (Dorrian, 2009: 87-88). Just as Gerster's vertical views attempt to scratch away the "varnish" of the everyday (1985), so Gowin aims to shock and disorient the viewer, and move them to reconsider their relationship with their environment:

> "When one really sees an awesome, vast, and terrible place, we tremble at the feelings we experience as our sense of wholeness is reorganised by what we see. [...] At such a moment, our feelings reach for an understanding." (Gowin, 1994, quoted in 2002a)

Faced with such immensity and vertigo the observer searches for a grounded reality, a narrative that collapses the distance of the aerial view and relates it to personal experience. Arthus-Bertrand, aware of this tension between far and near, strange and familiar, helps the viewer to contextualise his photographs within their own experience by providing a point of reference. Often referred to as simply providing a "sense of scale", such mechanisms are fundamental to the accessibility of his work. While these tensions are tackled less overtly in other artists' work, they are almost always present in the view from above. The specific meaning and narratives that arise from these tensions are far from universal however.

The artists discussed here cover a range of aesthetic and political concerns. At the beginning of the Twentieth Century the technologies and visual modes of aerial photography were intertwined with the ideals of Modernism, a symmetry that was emphasised by the Italian Futurists. On the other hands artists like Lanyon approach the aerial as a platform for artistic exploration without any overt political meaning. In the latter part of the Twentieth Century the aerial view became more associated with ecological and environmental narratives. Artists like Gowin, Arthus-Bertrand and Macdonald have approached these issues with work that is varyingly aesthetically based and politically motivated. In recent years warfare and surveillance has once again been foregrounded in the popular perception of the aerial. A number of contemporary artists have engaged with the moral issues surrounding the use of weaponised drones and remote surveillance using installation, performance and photography. Tomas van Houtryve's photographic series *Blue Sky Days* uses small unmanned aerial vehicle (UAV) photographs taken above the US to draw attention to drone warfare carried out by the US military overseas. Such overtly political artwork

demonstrates the ability for images to express a range of meaning. While there is no escaping political content, whether implicit or explicit, the rhetorical function of images is not the main focus here. This thesis is instead concerned specifically with how a new relationship with landscape and built heritage can be instigated through the aerial view.

Artists like Gowin and Bridges are driven to respond to their own aesthetic experiences. Their environmental stance is secondary, and borne out of that experience. Despite its varying cultural connotations flight, affords above all an interruption from the groundedness of everyday life. In this regard it has attracted the interest of artists seeking to find new ways of seeing familiar terrain. Creative practice provides a platform to engage with the personal and emotional experiences of landscape that flight can allow. Such considerations are particularly pertinent in relation to prehistoric built heritage, the understanding of which prompts us to reconsider our relationship with landscape and how it might have changed over time. While the aerial view was relatively recently made available by technology, its transformative nature challenges Modern conventions of vision and cultural relations to landscape. As such it provides the possibility of a powerful and culturally relevant platform for visualising built heritage.

Chapter 3 - New Media: Cinematic illusion and virtual reality

3.1 Introduction

Just as aerial photography can be considered a fundamentally technological mode of image-making - reliant on the machinery of the camera and the airplane - so the technological nature of new media is fundamental to its cultural framework. The pioneers of cinema used machinery to capture and project moving image in order to create an illusion of reality. André Bazin proposed that cinema was not driven by the technology of filmmaking but instead by a pre-existing ideology - like the desire for flight - that was enabled by technology:

> "Thus, the myth of Icarus had to wait on the internal combustion engine before descending from the platonic heavens. But it had dwelt in the soul of everyman since he first thought about birds. To some extent you could say the same about the myth of cinema […]" (Bazin, 1967, translated 2005: 22)

Bazin hypothesized a "myth of total cinema", the ideological aim of which was to achieve "an integrated realism, a recreation of the world in its own image" (1967: 21). The notion that a technical process might come to produce a total facsimile of the real can be traced back to the traditions of linear perspective in renaissance painting. In Bazin's view, realism is a preoccupation of the "plastic arts" that is driven by a psychological desire for "the preservation of life by a representation of life" (Bazin, 1967: 10). He frames the succession of technological advancements that underpinned new media - photography, moving image, soundtrack, and colour - as a progression towards an ideal where the illusion is indistinguishable from the reality.

This chapter will investigate Lev Manovich's provocative statement that Bazin's total reality myth not only remains a guiding force in new media to this day but also that, in light of technologies such as virtual reality (VR), it "appears to be closer than ever" (2001: 189). In archaeology the meaning of the term "virtual reality" has in the past been extended to encompass all types of computer generated imagery (CGI) that tend towards representation of the real. Gillings has questioned the lack of theoretical critique towards such methods within the discipline and suggested that this is in part due to a preconceived expectation of the function that VR will serve in an idealised future (2005: 224; 2002: 18). It will be argued that while the technology of new media has developed radically over the last century - in part due to this ideology - the total reality

that Bazin describes exists only as a shared fantasy of a romanticised future. The perpetually unattainable nature of this myth has only reinforced its romantic appeal. Further to this it will be suggested that VR and its predecessors demonstrate a shift away from an indexical representation of the real - implied in the photograph - because they acknowledge and exploit the subjectivity and agency of the observer. The current shift towards embodied interaction in VR is evidence of this. Despite a preoccupation with photorealism in CGI, new media is more concerned with a type of realism that extends beyond plastic appearance and relates to narrative, emotion, and myth. The field of visual effects filmmaking has played a significant part in the development of CGI technology. Despite its technological underpinnings, visual effects is essentially an art of illusion that very much focusses on the subjectivity of human observation. As the following sections will discuss, its origins stem from the traditions of stage magic.

3.2 Magic and realism in new media

While illusion and the imitation of the real is a consistent theme within art history, the role and significance of visual trickery has shifted between media and artistic movements over time. The linear perspective of Renaissance painting, for example, shifted the focus of realism from something gestural or symbolic to a simulation of the mechanics of optical projection from a single point in space. Subsequently artists were concerned not only with creating an illusion of figure or movement on the flat picture surface but also with replicating three-dimensional depth as perceived by the eye. According to Bazin this innovation created a division between the ambitions of “aesthetic” or “spiritual” realism on the one hand and the realistic representation of what things look like on the other (1997: 11). For Bazin the subsequent projects of plastic realism are driven by a psychological desire for transcendence through technology:

> “The need for illusion […] is a purely mental need, of itself nonaesthetic, the origins of which must be sought in the proclivity of the mind towards magic.” (Bazin, 1967: 11)

The pursuit of realism was again disrupted by the technological development of photography, which promised an automatic and indexical representation of the real world on the photographic plate. Although the photograph is often casually referred to as realistic, its “adherence to the appearance of things” could be better described as “naturalistic” (Shanks, 1997: 78). “Realism”, says Shanks, “is a project, not a formal set of conventions” (1997: 79). In agreement with Bazin, Shanks suggests that the formal conventions of “Naturalism”, or plastic realism, may or may not coincide with “theoretical, aesthetic, or moral” realism (Shanks, 1997: 79). As such the notion of

realism is a slippery one in any context, and particularly in relation to the photograph where - despite its perceived ability to produce a facsimile of the real - even its plastic realism is mediated by the artificiality of its process.

The development of cinema represented yet another shift in the technologies of realism. The inclusion of time allowed for movement, and with it the illusion of naturalistic life. Two kinds of motion were possible; movement of figures within the frame and movement of the camera/viewer. By affording movement to the observer cinema took a significant step away from the visual modes of static photography. At the same time the animation - or bringing to life - of human and non-human actors represented a kind of alchemy that attracted those who had made magic their life's work: the stage magicians of the Nineteenth Century.

3.2.1 From stage to screen

At the end of the Nineteenth Century a number of stage magicians were involved with the development and application of cinema, continuing a tradition of technological performance trickery that can be traced to earlier spectacles such as the magic lantern. The London engineer Robert W. Paul sold his film projectors to a number of notable magicians including David Devant, Georges Méliès, and Carl Hertz. Hertz incorporated his "Cinematographe" into his 1896 colonial tour and like many other performers fell victim to its success when, "just a few years later, the theatres no longer wanted the repertoire, just the film portion" (Barnouw, 1981: 6).

Georges Méliès on the other hand adapted his illusionary craft to the new medium, seeing the cinema as an extension, not an addition to his stagecraft. Incorporating what at the time were innovative effects, such as jump-cuts, with matte background and pyrotechnics, Méliès has come to be considered a godfather of special effects and visual effects cinema, despite receiving little recognition in his time. Other pioneering film makers, such as the brothers Auguste and Louis Lumière, focused their efforts on the more "realistic" sampling of life. Films like the well-known *L'arrivée d'un train en gare de La Ciotat* ("The Arrival of a Train at La Ciotat Station", 1895) depicted everyday action, in this case a train arriving at a station, in a single unaltered shot. Gunning argues that the appeal of such "realism" was not so far from the appeal of the Lumière brothers' more explicitly illusionistic counterparts:

> "[...] the projection of the first moving images stands at the climax of a period of intense development of the visual entertainments, a tradition in which realism was valued largely for its uncanny effects." (Gunning, 1989: 116)

Gunning suggests that the audiences of early films were not "naive spectators" fearful of the moving image of an approaching train, as has sometimes been imagined, but rather sophisticated observers able to distinguish between experienced reality and the projected image. Their delight came from precisely the imaginative possibilities raised by the contrast between these two, and the uncanny trickery that allowed the two to coexist (Gunning, 1989). In short, both then and now, cinema relies on the suspension of disbelief; a willing participation in the illusion by the audience.

The division between realistic and fantastical filmmaking was quickly blurred as the initial trickery - such as the dissolves and splices readily employed by Méliès - "became the basic vocabulary of realistic film" (Ezra, 2000: 2). These conventions in turn developed into filmic mechanisms - such as montage - that can only exist on screen. In light of these devices, Champion states, "film is intentionally unrealistic" (2011: 43). The explicitly unrealistic nature of cinematic language poses a challenge to Bazin's view that a "total reality myth" was a driving force behind the development of cinema:

> "In their imaginations [early film pioneers] saw the cinema as a total and complete representation of reality; they saw in a trice the reconstruction of a perfect illusion of the outside world in sound, color, and relief." (Bazin, 1967, translated 2005: 20)

While this ideal might well have inspired those behind the development of cinema, the resulting medium exploits such naturalistic representation only so far as it is useful to the ends of successful storytelling. Today, despite its technological capabilities, cinematic language has developed far from the scenario that Bazin describes. The capacity to distort, cut and edit the physical world of appearances does not necessarily detract from the believability of cinema. This distinction - between plastic appearance and poetic realism - has been obscured in a time when the technologies of CGI have been developed specifically to afford "photorealism" to cinematic illusion.

3.2.2 Computer generated photorealism

Much of the technology and application of CGI has been preoccupied with achieving a particular type of realism concerned with appearance, often referred to as photorealism. The aim of photorealism in CGI is to create synthetic images that are indistinguishable from a photograph. This ambition is in part based upon a conflation of the photographic image and the real, an association that has been contested.

In archaeological visualisation the notion of photorealism has been challenged because it suggests an unrepresentative symmetry between reality and the photograph (Shanks, 1997: 78-79). Bateman reports that during archaeological excavation, photography "is presented as an archaeological reality, unhindered by the means and the technology of its production" (2005: 194). Despite this, as Bateman notes, photography is very much mediated by its methods of production, with both technological and human influences shaping the final image. Gillings warns against accepting photography as "a transparent window" reminding us that "photographs teach a particular way of seeing" (2005: 229). While photography inherently filters and alters the real (Bohrer, 2005: 184) it is sometimes accepted to capture the world in a way which is unmoderated, creating an illusion that it automatically inherits the scientific objectivity valued in archaeological recording. Such assumptions, that the photographic image is associated with objective accuracy, also vary depending on the context of viewing.

While photography has always been vulnerable to bias, alteration and political influence, the advent of digital photography and photo-manipulation has to some extent framed photography in the context of craft rather than objective record-making. In the words of Pedro Meyers, who pioneered digital photography as an art medium by producing explicitly altered images, "isn't it about time that we come to terms with the fact that photographs have never been *the* truth about anything" (Meyer, 1997, original emphasis). Gurevich suggests that there is less expectation for indexical accuracy in photorealistic CGI in the context of cinema because of the influence of "movie culture" (Gurevitch, 2012: 241) with its inheritance from stagecraft, spectacle and illusion. This suggests that while the photograph might still be endowed with undue authority, photorealistic CGI has been divorced from the notion of reality by audiences acclimatised to visual effects illusion, particularly in cinema.

In practice the term photorealism is often used to refer to CGI that has an artificial appearance. Many of these photoreal images could be better described as *hyperreal* in that they are more

idealistic than naturalistic. This is in part because some methods of rendering (the process of digitally simulating the interaction of light and surface) will create dramatic effects which are not necessarily true to life but are enhanced, similar to how studio lighting can be used in photography and film. When reconstructing the prehistoric settlement of Çatalhöyük, Grant Cox successfully demonstrated how CGI could be used to replicate naturalistic appearance - by closely reproducing a reference photograph - but acknowledges that methods of photorealistic rendering do not produce an accurate result by default. Instead, "a very manual, subjective workflow" was required to bring the render close to the reference photograph (Cox, 2014). This highlights how the approach of CGI artists, who are comfortable judging fidelity by eye, contrasts the perceived scientific verifiability that others associate with digital simulation. The tension between creative judgment and scientific process in archaeological visualisation will be explored more in the following chapter. As a result of the manual judgement that Cox describes it is easy to see how CGI images, that use sophisticated render tools but are not closely based upon photographic reference, can move towards the hyperreal.

Another way that photorealistic CGI departs from the representation of outside appearances is where the unique characteristics of the photographic image are introduced. Picture artefacts such as vignette (the darkening of the edge of the frame), motion blur, depth of field and film grain are artificially added to CGI to emulate the appearance of filmed images. According to Earl, the deliberate blurring of the lines between the appearance of CGI and more familiar, traditional techniques both "conceal[s] the constructed nature" and "empowers" digital technology (2006: 173). Manovich suggests that, despite the potential for digital images to develop their own visual language, filmic images will continue to be used in a digital era because of their closeness to human vision:

> "Cinematographic images are very efficient for cultural communication. Because they share many qualities with natural perception, they are easily processed by the brain." (Manovich 2001, p.180)

Criticism of photorealism within CGI visualisation on the basis that it ascribes undue authority to the image is based on only one function of photographic vision: as an indexical, objectively accurate record. The photograph has never acted completely as such and, nor - in a time of

cinematic illusion and the ubiquity of CGI - is it widely accepted as such. Photography is mediated by craft, and beyond that closely tied to the subjectivity of human vision, as the next section will explore.

3.2.3 Stereoscopy

Long before cinema - and later CGI - disrupted photography as a form of representation, stereo photography had already challenged the myth of objective vision. In 1851 David Brewster demonstrated how, using special viewing apparatus (note that stereo photographs can also be viewed unaided), pairs of photographs taken side by side could be viewed in such as a way as to emulate stereo depth perception. Throughout the late Nineteenth Century the popularity of stereo photography reached its peak with images from around the world being reproduced by intrepid photographers - such as Francis Frith who photographed in the Middle East and ancient Egypt - for viewing at home. More than simply acting as a record of a particular vista, these stereographs were a *spectacle*: their thrill relied on the sensation and novelty of engaging the viewer's stereo vision.

It has been suggested by some that the stereograph's reliance upon bodily engagement disrupted the modes of vision fundamental to Nineteenth Century modernism (Maxwell, 2000; Saint-Amour, 2003; Gurevitch, 2012). Where the photograph carried authority because it was the result of a purely mechanical, objective process, the subjective human interpretation necessary to read the stereograph posed a challenge to the assumptions of the subject/object divide central to the modernist worldview. This contrast was particularly pronounced when stereographic technology was later adopted in order to interpret aerial reconnaissance photographs during both World Wars. In the midst of a military mechanism predicated upon technology, Saint-Armour notes that "aerial stereophotography did as much to expose the spatial and biological contingency of its observers as it did lay bare the terrain it depicted" (2003: 363).

The sensational nature of stereoscopic viewing can be considered a precursor to the spectacle of cinema. Comparing Benjamin Kilburn's stereograph "Sky Railroading" to the Lumière Brothers 1895 film "Train Leaving the Station", Guravitch describes Stereoscopy as a "proto-cinematic spectacular attraction" (2012: 243). According to Guravitch the rapid decline of the stereograph at a time when cinema was gaining popularity suggests that audiences found an attraction common to the two media (2012: 241). Perhaps, as in stage magic, both derive a thrill from a visual deception where the observer is tricked into perceiving depth/movement. Beyond this, both

media draw the viewer into the frame by involving the biology of perception in a way that is missing from a static, monographic image. In doing so these modes of vision highlight the subjectivity of the observer, and the active role they play in perceiving a scene. In cinema this activity is particularly pronounced where the camera is allowed to move freely through the scene, affording an impression of both time and the three-dimensional space.

3.3 The flying camera

With the advent of cinema came a novel ability to record naturalistic action and at the same time explore space by moving the camera. The tracking shot, where the camera is wheeled sideways on a dolly, has a number of advantages. The action is no longer limited to a fixed frame, as in theatre, but can take place in a broader setting. As the camera moves through an environment the audience perceives the three-dimensional space due to the effect of parallax; that is objects move and distort according to their distance from the camera. This parallax is how we commonly perceive environments as we move through them in our everyday lives. When the camera is removed from the tripod and allowed even more axis of freedom in flight, the result is a view that is outside of everyday experience and yet still related to our familiar interaction with space through movement. This is a radical departure from photography as a mode of vision because there is no longer a direct correspondence between image and environment. Instead space is perceived over time, affording the observer the sensation of being present in the scene.

This section will consider two films that use a free flying camera, one facilitated by a dirigible balloon aircraft (“En dirigeable sur les champs de bataille”, 1919) and one created using digital visual effects (“The Campanile”, 1997). It will be argued that both films benefit from the scalability of free movement and that, through movement, both present a sense of presence and agency within a predetermined film world. This embodied presence has parallels to earlier stereoscopy and is also related to the free movement later afforded by VR.

3.3.1 Early cinema in flight

Castro describes a series of films taken from dirigible balloon in 1918-19 above French landscapes devastated by World War One. Moving on from the tracking shots that the Lumière brothers had begun experimenting with, these films marked an “alliance” of cinematography and flight which - according to Castro - served to give a better sense of the landscape topographically but also allowed for a more personal, emotional involvement with landscape:

> "...emotion linked to the pleasure of discovering the earth from a fresh point of view; emotion attached to the sudden recognition of the land as a wounded body; and emotion, finally, arising from being able to travel freely through space-time." (Castro, 2013: 125)

The emotive significance of movement through an environment has received much attention in British landscape archaeology since the mid 1990s, when scholars drawing influence from phenomenological philosophy became concerned with more personal and emotional engagements with landscape. Some creative responses to these concerns will be explored in the next chapter. Castro's association between a personal relationship with landscape and freedom of movement through it suggests the possibility of a departure from a subject/object relationship and instead transforms the audience into a protagonist with a place in the on-screen world. This aligns with the phenomenological view that environments are perceived through an active correspondence between the observer and the observed (see Ingold, 2013: 105-108). In this case - while the film allows no interaction - the sensation of movement over the scene creates a sense of presence, and thus an illusion of agency.

On a more pragmatic level the moving camera provides a great deal of three-dimensional information which the viewer perceives via parallax, as objects shift and transform relative to the moving viewpoint. This is a naturalistic way of understanding a three-dimensional scene, in that parallax can be perceived whenever an observer moves relative to an object or environment. Unlike stereo vision - which must be distorted via "hyperstereoscopy" in order to be usefully applied to large landscape views (Saint-Amour, 2003: 359-362) - parallax resulting from movement is also scalable, meaning that the observer can perceive moving around a landscape in much the same way as they would perceive an object within arm's reach. The way in which the parallax available to a moving camera quickly extends beyond that of stereo vision might be one of the reasons why, despite a number of attempts, stereo cinema has never become the norm. This scalability - combined with the thrill of discovery and sense of freedom that Castro describes - has been playfully explored more recently in visual effects film where computer modelling, along with aerial platforms, enable unprecedented freedom of movement in cinematography.

3.3.2 Visual effects cinematography

In 1997 Paul Debevec presented a short film, "The Campanile", to audiences at SIGGRAPH, the international conference for computer graphics. In the film the camera tumbles seamlessly between filmed and computer generated versions of the Campanile tower on the Berkeley

campus. To achieve this continuity between film and CGI, photogrammetric modelling was employed using methods developed in part during Debevec's PhD research at the University of California (Debevec, 1996). The Campanile project opened up new possibilities for how a virtual camera could move and subsequently influenced digital visual effects cinematography, most notably the influential "bullet time" sequence of "The Matrix" (1999).

The unhindered flight of the virtual camera around the Campanile tower was enabled by photo textures taken of the surroundings from the top of the tower, supplemented by kite aerial photographs of the tower itself taken by Charles Benton, a fellow student to Debevek at Berkeley. The fidelity of the film comes from its blending of photography and CGI. Rather than digitally building a virtual tower from scratch, Benton and Debevoc collaborated to photograph the Campanile from a similar angle of view to that of the virtual camera. The resulting image is a synthesis; the details are not entirely a digital model nor an aerial photograph but a subtle blend of the two. This blending and layering of real and simulated elements would come to define much of the methodology of visual effects cinematography in film and television.

The Campanile project also highlights the crossover between the interpretive capabilities of aerial photography and CGI. Both methods free up the camera to afford a novel, and in this case playful, way of seeing a familiar landmark, without departing from the lexicon of normal vision. The tumbling flight of the camera in "The Campanline" transforms the tower from a landmark on the Berkeley skyline to a three-dimensional object perceived in the same way as an object turned over in the hands.

The immediacy of the three-dimensional perception afforded by the flying camera is exploited within architectural visualisation in the fly-through video format where the aim is to provide a rapid and naturalistic impression of the form and feeling of a built environment. The suitability of the fly-through for the purpose of archaeological visualisation has been questioned by Gillings who suggests that its departure from a natural perspective is at odds with the need for accurate representation in archaeology (2005: 227). In light of the gap which exists between CGI and the real in any case, it might be more useful to consider such mechanisms less in terms of their accuracy and more for what they offer as a visual language employed to describe the simulated space. Flight is of course an uncommon way to see the world (Tilley, 2008: 272), but as a method of visualisation it is at once information-rich and naturalistic on a sensational level.

While the flying camera might encourage a sense of presence, by exploiting the sensation of movement and allowing us to perceive space as we do naturalistically, computer graphics also allows for the possibility of interaction using real-time rendering. Interactive CGI and VR platforms continue to utilise biological mechanisms of perception, except that here the observer is more literally an active agent who can bodily interact with a virtual environment. These technologies move further away from the static image as a benchmark for visual representation and further prioritise the observer in the process of perception.

3.4 Embodiment and virtual reality

According to Curtis, it was the science fiction writer James William Gibson who first conceived the transformative potential of digital space (2004: 31-35). In his works - published through the 1980s and '90s - Gibson described virtual spaces which represented abstract concepts. The hallucinatory environments were experienced by characters "jacked" into "cyberspace" (both terms which Gibson himself used) just as the characters of "The Matrix" film trilogy did (1999-2003), firmly establishing Gibson's concepts in the public imagination. While Gibson's cyberspace was an abstract architectural metaphor for real-world interactions, the virtual world of the Matrix also drew influence from Jean Baudrillard's version of a simulated reality - outlined in *Simulacra and Simulation* (1981) - where the sensory deception is so complete that the simulation becomes more significant that the reality. This fictional realisation of Bazin's total reality myth is made possible by a complete embodied interaction with the simulation.

Computer generated imagery and virtual reality technologies are often casually referred to in terms of their closeness to this total reality. Such speculation is based on an assumption that reality can be represented by purely technological means and rarely take into account the role of human perception - at once finely tuned and irrational - in the construction of the real. Recent developments in VR interaction perhaps mark a shift from our preoccupation with the photoreal image towards a focus on the real as accessed through embodied experience. This is a significant step, foreshadowed by stereoscopy and cinema, and one which gives the observer a truly active role in perceiving the virtual environment. The following sections will explore the freedoms and limitations of interactive VR and consider whether it really does represent final realisation of the total reality myth.

3.4.1 The obstructions and freedoms of digital presence

Where a CGI environment is interacted with on screen, the embodied presence of the user is obstructed by the display and control devices. While head mounted display and motion tracking technologies attempt to reduce these obstructions by better integrating with the body, more traditional interfaces must find other ways of bringing the user into the scene. When navigating the interactive reconstruction model of St Andrews Cathedral (released by Open Virtual Worlds, University of St Andrew, 2013) the user has the option to control their digital presence in third person view. This allows them to "inhabit [the 3D environment] through the proxy of an avatar" (Kennedy et al., 2013), a device adopted from the language of computer games. Users can choose the appearance of their avatar and their interactions follow the rules of the virtual world meaning that, as well as walking around the environment, they can also teleport and fly (figure 3.1).

Figure 3.1 - An avatar flying above a CGI environment. Cathedral reconstruction by the Open Virtual Worlds group, University of St Andrews, © (CC-BY).

The realism of such an "experience" is purely allegorical and yet this type of interaction is legible because it draws from the existing conventions of computer games, adding to the platform's accessibility (Kennedy et al., 2013). Champion argues against such abstraction from the constraints of the physical world:

> "Digitally simulated space is far too rarely constrained and contextualized by the presence of other forces or influences to convey accurately the embodied experience of real places." (Champion, 2011: 35)

On the other hand Coyne points out that the freedom to "transcend the constraints of physical space" is a fundamental feature of cyberspace (1999: 79). There would be little point in "accurately" limiting the movements of an observer who is already constrained by the interface devices, in this case the computer monitor and controller. Despite the perceived realism of CGI environments - usually meant in terms of photorealism - there is little correspondence with the real world. The user's experience of a virtual world is by default analogical, or by-proxy. Recent advances in the technologies of VR represent in part an attempt to bring the user's digital interactions closer to physical reality, but do not necessitate a move away from the analogical nature of digital presence.

3.4.2 Immersive virtual reality

The criteria for realism in VR is not only concerned with the indexicality of the photographic image but with the *bodily* verification of the real. Coyne notices that we commonly test for the real by interacting with it: "The notion of the real", he states, "is intimately connected with embodiment" (Coyne, 1999: 49). The bodily interaction afforded by recent advances in motion tracking and head mounted display technologies - such as those exploited by the Occulus Rift and HTC Vive systems - take advantage of this fact. While these technologies share the characteristics of traditional stereoscopy - which already utilises the bodily function of stereo vision - VR headsets also responds in real-time to movements of the head and can track the hands via additional devices.

An assumption that VR will play a significant part in the future of computing has existed long before these technologies were developed to a stage where they were comfortable to use, or widely available. This "yearning" (Penny, 1993: 18) could be the most recent incarnation of Bazin's total reality myth in action, as Manovich suggests (2001: 189), or a response to the frustration towards the barriers of human/computer interaction mentioned in the last section. At any rate the ambitions of VR are complicated by the difficulty of defining realism and, as Gillings points out, pose the question of what it means "to describe something as virtually real" (2003: 17)? Immersive VR content has two seemingly conflicting aims: on the one hand there is an attempt to bring the virtual environment as close to the user's perception of the real as possible, while at the same

time gameplay mechanisms are incorporated in order to both circumvent the limitations of the technology and exploit the potential for cyberspace to operate outside of the constraints of the physical world. The user must suspend disbelief in the latter, in order to fully immerse themselves in the former. Despite many technological developments in the intervening time, the audiences of VR environments are complicit in the same "intellectual disavowal" (Gunning, 1989: 117) of those who witnessed technological stagecraft at the turn of the Twentieth Century.

Champion suggests that, rather than relying on the mechanisms of gameplay, VR worlds could be improved by a better understanding of the "environmental affordances" of the physical world and the ways in which place is perceived culturally. This could be achieved by making VR content that is more personal and naturalistic as well as by reconsidering the contextual world surrounding the virtual representation (2011: 44-45). The challenge set by Champion cannot be met only by improved VR interfaces, with fewer obstructions to bodily interaction; it is a challenge for the cultural context within which VR content is set. While the requirements for *naturalism* can be defined within relatively concrete perimeters, the pursuit of *realism* calls for a sensitivity to both the biological and cultural perception of our environment. This means designing VR around the meaning of its interactions rather than simply aiming for as naturalistic a representation as possible. In Coyne's words:

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

Just as cinema rapidly developed its own rules and syntax outside of the physical world, the potential of Gibson's cyberspace is that the user is at once limited by and liberated from the constraints of the physical world. A language of VR, built around these limitations and liberties, is still emerging.

3.5 Summary

This chapter has framed the history of new media as a discourse on the notion of realism. Cinema's origins in stage magic and spectacle set it apart from the paradigms of objective, indexical vision sometimes associated with photography. While the act of making and viewing images has always been politicised and embodied, the explicitly subjective and sensational nature of cinema - and stereography before it - disrupted the notion that the camera obscura could represent reality unmoderated by human interference.

Cinema is sensational in that both movement and space are perceived naturalistically, but its attraction is also one of illusion and the uncanny. It is easy to associate Bazin's total reality myth with early films such as The Lumiére Brothers' "The Arrival of a Train at La Ciotat Station", which present a naturalistic image as far as possible within a single stationary shot. The appeal of such attraction is short lived however and cinema audiences today look for other levels of realism beyond plastic appearance. Realism in cinema is as concerned with story and emotion as it is with presenting a naturalistic image. As such the visual language of cinema is often intentionally unnatural (Champion, 2011: 43); the film world does not need to represent the physical world for it to be realistic. This point has been obscured by a preoccupation with photorealism in CGI. The intentions of photorealism are not necessarily to reconstruct a naturalistic representation however, but rather to reference the visual language of film and photography. Realism in CGI, cinema, and indeed photography, extends beyond plastic appearances.

Similarly in VR a one-to-one correspondence with appearance is secondary to the allegorical realism of the virtual world told through the language of the medium, to date largely inherited from computer games. The role of embodiment in defining the real - while present in earlier media like stereoscopy and cinema - is foregrounded in VR where technological development has focused on reducing the obstructions to embodied interaction presented by the input and output devices. This is significant because the observer - as they navigate and interact with a virtual environment - is explicitly made part of the process of representation. This marks a step away from the subject/object model of vision that dominated the Twentieth Century. Here the subjectivity of the observer is not only acknowledged but actively exploited in the formation of the virtual space.

Despite efforts to replicate the physical world, certain liberties - such as flight and teleportation - are likely to continue to define how we interact with virtual worlds, just as they have come to define the language of film. Baudrillard's (1981) notion of "hyperreality" suggests that the stories told in cinema - and now VR - can be compelling and meaningful to the point where we could consider them real, while at the same time they are divorced from our experience of the everyday physical world.

It is the author's view that much of the Twenty First Century fetishisation of digital visualisation and VR technology is as a result of a modern incarnation of Bazin's total reality myth, with its promise of transcendence from the bounds of the everyday world. What this ideal does not take into account however is that realism in new media is allegorical. It is defined by culture not by

technological means and has as much to do with the personal, the social, and even the mythological as it has to do with appearance (Champion, 2011: 44-45). With this in mind we are left with the question of how Bazin's concept of total reality can be reached if the real "resists representation", and is "ineffable" as Coyne suggests (1999: 269)? In all likelihood the total reality myth is destined to remain mythical, perhaps as Bazin intended it, forever out of reach. It is an analogy that has driven a series of technological developments in image-making but more importantly provided a platform for storytelling, prompting us to question our relationship with the real world, and our ability to represent it in images.

Bazin's total reality myth relies on a concept of reality that is at odds with the personalised and contextualised nature of lived experience. In attempting to create a total facsimile of the real in heritage visualisation we risk digitally preserving a version of built heritage which is static, impersonal and idealized. If we accept that embodied engagement is key to our understanding of built heritage, then we must integrate not only temporality but also the serendipity and imperfection of that experience into our visual representations of place. In his provocative essay "The Vital Illusion" (2000) Baudrillard states:

> "[...] we must fight for the criminal imperfection of the world. Against this artificial paradise of technicity and virtuality, against the attempt to build a world completely positive, rational and true, we must save the traces of the illusory world's definitive opacity and mystery." (Baudrillard, 2000: 74)

It is suggested here that creative practice offers one possible way to deepen Baudrillard's "mystery" and meaningfully engage with virtual environments in a way that reflects the multifaceted and irrational real world. Such an approach is tacitly understood in such fields as animation, visual effects and game design. These issues of representation and realism are particularly pertinent to visual practices in archaeology, which is at once concerned with interpretation and personal experience as well as the accurate recording required for scientific process. The following chapter will explore the relationship between creative practice and archaeology, particularly in the visual arts, and set the context in which new media is utilised for heritage storytelling in the Twenty First Century.

Chapter 4 - Archaeological vision: From the Romantic to the Postmodern

4.1 Introduction

A modern day visitor to the Parthenon in Athens could at first glance attribute its ruinous appearance to the slow passage of time. In fact the building remained largely intact for much of its history and was reduced to fragments in a single moment in 1687 when a mortar shell fired by Venetian troops ignited a gunpowder magazine stored inside. This was not an act of wanton destruction of the ancient relic. While the Venetians subsequently won the battle to control the Acropolis, the loss of the building - which had significant cultural currency - was regrettable for both sides. Vincenzo Maria Coronelli, cartographer and cosmographer of the Venetian Republic, documented the campaign in a series of maps, plans, and vistas of the new territory. Among these engravings, which record the Acropolis in detail, the revered Parthenon building is shown intact in a detailed one-point perspective. Copies of these images were disseminated across Europe to celebrate the Venetian conquest. The apparent measured accuracy of these images affords them an authority and implied impartiality. In fact, just as many cartographic projects serve an ideological purpose (Cosgrove, 2008: 155), these images were deeply rhetorical, serving the purposes of propaganda rather than of objective survey. Where history is written by the winners it is dictated all the more convincingly through images.

The relationship between a culture and its past is almost always tied up in ideas of identity and political ideology in the present. Levy maintains that “archaeological representation is intrinsically political because it is about who controls interpretation and about connecting people to place” (2006: 136). Archaeologists today are increasingly aware of the inherently political nature of even apparently impartial images. The Venetian seizure of the Parthenon marked the beginning of a long chronology of looting, appropriation, and contested cultural ownership of the building - and its adorning carvings - that is ongoing today. This story is about representational images as much as it is about the physical marble that makes up the structure (see Fehlmann, 2006). So archaeology, which concerns itself with material culture, is unavoidably also a discipline of images. Archaeology is recorded, interpreted, and disseminated via photographs, scale drawings, sketches, and interpretative reconstructions. In all of these media there exists a tension between a need for scientifically verifiable evidence on the one hand and the cultural context of viewing, that influences even the most scientific of images, on the other.

Archaeology is a diverse discipline that, as a whole, has always transcended the boundaries between science and the humanities. As such these issues have been much debated, particularly in a “post-processual” context where the subjectivity of archaeological interpretation has been foregrounded. Archaeology has become a markedly introspective discipline, in part due to influences from anthropology which seeks to understand not only foreign cultures, but also the cultural baggage of the observer and how this influences the findings. During the mid 1990s a number of British landscape archaeologists came to question what they saw as the undue authority of geographic information systems (GIS), digital modelling, and remote sensing technologies that were rapidly developing at the time. Their concern was that in seeing the remains of the past through modernist, technological modes of vision, other significant interpretations of prehistoric landscapes were being lost. Drawing influence from particular readings of continental philosophy and postmodernism, these archaeologists concentrated on experiential understandings of landscape that were missing from conventional survey methods. Among the alternative approaches suggested, creative practice was proposed as a possible method of observation and interpretation.

This marks just one juncture in a long history of cross-fertilisation between the fields of art and archaeology. Artists have always drawn from archaeological subject matter and, since the emergence of archaeology as a formal discipline, have also undertaken various forms of collaboration with the processes of archaeology. In turn archaeology has shown varying degrees of interest in the possibilities of creative practice as a method of visualising the past in unconventional ways. Sometimes this relationship is truly interdisciplinary while at other times there is a more one-sided appropriation of one discipline by the other. Colin Renfrew has examined where the interests of artists and archaeologists have aligned in recent decades, such as in their common pursuit of meaning through engagement with craft and materiality (2003). This chapter will examine how archaeological vision has been shaped by the aspirations of both scientific recording and creative image-making, with particular focus on landscape. Various forms of Romanticism, adopted in response to a perceived threat of rationalisation in a Modern era, will be a theme which runs throughout the examples discussed here.

4.2 Romantic vision

For antiquarians - the forerunners of archaeologists - there was less of a division between measured recording and subjective narratives. At the end of the Eighteenth Century antiquarians built their own experiences and interpretations into their images of the past alongside scale plans

and diagrams. For them, complete recording incorporated both measured observation and personal impression. This approach was challenged by archaeological practice which foregrounded scientific rigour. By striving for objective observation, archaeology - like all scientific disciplines - attempted to eliminate subjectivity and bias. Personal impressions of the places, materials and narratives of prehistory - once a part of antiquarian pursuit - were marginalised under “processual” archaeological theory in favour of rational aims and methods. These subjective impressions fell instead to the realm of creative practice, kept at arm's length from archaeology's scientifically grounded basis (Smiles, 1994: 8). This divergence of the rational and irrational coincided with a broader split between Science and Art that occurred at the turn of the Nineteenth Century. This was instigated by attempts to rationalise nature that stemmed from Enlightenment ideals, which in turn led to the counter response of Romanticism with its emphasis on beauty, subjectivity, and the individual’s experience.

When creative practice was relieved of the role of accurate recording by scientific measured drawing, it became more exclusively involved with experiential, impressionistic, and mythical concerns. A similar pattern occurred in Modern Art when photography further relieved the responsibilities for naturalistic recording from the art world. Such divisions are a mixed blessing in archaeology. On the one hand archaeology is the study of the material remains of the past and relies upon scientific method to analyse such material. On the other hand it is also the study of human culture. A rational understanding of the artefacts and architectures of the past has little meaning without an interpretation of the - partially irrational - people behind them. This process of interpretation, where speculation is made about the meaning of material remains, places the discipline of archaeology at a juncture of science and the humanities. Despite this, some are concerned that archaeology sufferers from a predisposition to a mindset of scientific rationality when investigating the past, particularly considering that such ways of thinking belong to a distinctly Modern paradigm (Thomas, 2004) that was not necessarily shared by past cultures. Because of this a number of attempts have been made to engage with the domain of creative practice, which offers alternative and disruptive ways of seeing and thinking about landscape and materials.

4.2.1 Landscape painting: Beauty and the sublime

The English Romantic painters John Constable and J. M. W. Turner both painted watercolours of Stonehenge in dramatic weather, a common theme in Nineteenth Century depictions of the site. In Constable’s depiction the vertical stones draw the eye from the barren Salisbury Plain to the

imposing skies above. Figures amongst the stones give a sense of scale and human presence. Smiles notes that, compared to earlier depictions, such images show diminishing concern with accurately recording the topography of the stones and surrounding landscape. Instead the prehistoric site sets the stage for a dramatic and emotive scene to be played out. The interests of the Romantic artists lay in the aesthetics of the "sublime" (Smiles, 1994: 168). Prehistoric sites which had previously been the domain of folklore and antiquarian speculation were increasingly subject to more rigorous archaeological scrutiny. The Romantic imagination on the other hand recognised the aesthetic potential of such sites where ancient heritage and natural forces provide a glimpse of raw primeval forces.

The dramatic lighting and cloudscapes that dominated many of the Romantic landscape paintings of this time afforded a platform to project meaning onto otherwise inanimate landscapes. Constable himself believed that the sky was a vessel to express mood and emotional sentiment in painting (Gruffudd, 1991: 19). This emotional meaning could be deeply personal: brooding thunderstorms betraying Constable's sadness after the recent deaths of his wife, and of his close friend, for example (Wilcox, 2000: 157). Such sentimentality foregrounded the role of the subjective individual, but it also bestowed emotional and moral agency upon the landscape itself. Romantic artists showed built heritage and nature as sensational places. This was in part because, while dealing with the social and environmental implications of the industrial revolution, they perceived the imagined values of the pre-industrial era as one possible antidote to the mechanisation and rationalisation of the natural world. As such we can say that their interest lay in a mythology that was projected upon the past, rather than in understanding the actuality of the past events, as the emerging discipline of archaeology was attempting to do. This mythology, where images of an imagined past are used as a vehicle for emotional and moral meaning, would later influence Victorian painting traditions such as the Pre-Raphaelite movement.

Labbe points out that the Romantic "sublime [was] arguably, a masculine rite of passage" (1998: 36). The notion of rising above the natural world - both physically and metaphorically - to achieve a sublime vision of the world was central to post-Enlightenment worldviews. For example, J. M. W. Turner favoured the elevated view for landscape paintings, placing natural beauty at a distance beneath the viewer's gaze. While such elevated views relate to a complex relationship with landscape – many of Turner's landscapes are certainly imagined as powerful natural forces rather than passive objects - there is no escaping a degree of privilege that accompanies the "god's eye" view in a Romantic context. In the early Romantic period at least, such ascension was assumed

to be the domain of masculinity. In turn, beauty was regarded as a feminine attribute, here ascribed to the natural world. In such terms we can consider that the mode of vision of Romantic landscape art was dominated by male gaze. Despite this, Romanticism opened up the possibility for new types of engagement with landscape that were more sensitive to the dynamic forces of nature. These forces would eventually be given a more active role in the creation of artworks, such as in the form of Land Art which again would look to prehistory for inspiration. The Romantic mindset however, would prove difficult to shift.

4.2.2 Neo-Romantics

During the interwar years a number of British artists again turned to prehistoric sites for inspiration in a bid to return to universal human themes in the midst of a modernising world. “At a time when contemporary abstract art was regularly accused of being inhuman and mechanistic”, says Smiles, “here was a resource that offered both the rigours of abstraction and the human qualities of ritual and purpose” (2003: 33). Painters like Nash - who had painted landscapes from the trenches as official War Artist during World War One - were interested in the aesthetic power of the ancient monuments in the British countryside. For such artists one of the attractions of these prehistoric sites was that, while they are strong visual statements of human intent, they belong to lost cultures with no specific political baggage. Because of this - in addition to their overgrown appearance - the remains almost form part of the landscape, and as such are open for the artist to project their own meaning on to. In Nash’s surreal depictions, this meaning was a poetic one of dream-like analogy. His 1937-38 painting *Circle of the Monoliths* is an abstracted version of Avebury stone circle where the landscape has been distorted to incorporate the coast. His earlier painting *Equivalents for the Megaliths* (1935) - recently interpreted as relating to concrete markers that were installed by archaeologists in the 1920s and ‘30s (Wickstead and Barber, 2015: 14-15) - is more explicitly symbolic. By comparison John Piper’s painting of Avebury with its surroundings and associated artefacts, named *Devizes Antiquities* (1983), shows an interest in pictorial - if not wholly accurate - representation of the archaeological subject matter. While Barbara Hepworth’s sculptures have also been associated with prehistoric forms, despite their apparent “visual equivalen[ce]” to the megaliths (Curtis and Wilkinson, 1994: 113), Hepworth’s interest lay in the aesthetics of Modernism rather than in referencing past cultures. In a time when much of the Modern art world was concerned with developing a post-Cubist visual language, British artists who also incorporated the landscape heritage of their home country made a timely appeal to sentiments of traditionalism and national pride (Smiles, 2003: 33).

Associations made between contemporary artworks and ancient heritage at the time were often entangled with notions of national identity. While the visual representation of landscapes heritage in cartography and art can almost always be seen as some claim to intellectual ownership of place, these connections were particularly appealing at the time in which the Neo-Romantics were working. At the beginning of the Twentieth Century, against a backdrop of international conflict and the increasing threat of modernisation with its shift towards the urban and the global, the prehistory found hidden away in the British countryside was a welcome reminder of long standing national heritage. This mythology of an ancient and natural Britain was at the root of the analogies within Nash's painting during World War Two (Gruffudd, 1991: 22). Eric Ravilious' watercolours of chalk hill figures - painted at the onset of World War Two - instilled a sense of a landscape rich in ancient heritage (although in fact it is unlikely that the geoglyphs are prehistoric). Artists like Nash and Ravilious showed little interest in archaeological understanding. Instead their work responded to traces of built heritage within the landscape in a general way, in terms of their aesthetic or symbolic meaning.

4.3 Land art

In the late 1960s the Land Art movement in the US suggested that nature could not only be the subject of artworks but also form part of their very fabric. It set out to explore new relationships with the natural world through artworks that drew heavily from prehistoric material. Robert Smithson made what is among the most iconic land-artworks - or *earthworks* as he termed them - of the American movement, titled *Spiral Jetty* (1970). The rock causeway extends some 160 meters from the shore of the Great Salt Lake, Utah, in an artwork that forms a contiguous part of the landscape. Pieces like *Spiral Jetty* represented a rejection of the gallery space, along with what was perceived as an exclusivity and superficiality that existed within certain parts of the art world. Earthworks are often, in part by the necessity of their scale and placement in the landscape, a very public form of art. Beyond this the Land Art movement instigated a radical shift in the relationship between creative practice and nature. Where in the past the natural world may have been revered as the subject of painting, viewed through the window of the landscape panorama for example, here natural forces directly shaped both the process and outcomes of the artwork. Landscape is more than just a medium in land art. The ways in which land artists integrate their work into active environments can afford the land its own voice and, at times, a protagonistic role in an act of co-creation with the artist.

Nancy Holt's *Sun Tunnels* (1973-1976) is another large scale iconic piece that was placed in the landscape with great sensitivity, and was also constructed in relation to celestial alignments. The four concrete pipes coincide with the summer and winter solstice at sunrise and sunset. Here the celestial movements are incorporated into the artwork, a clear parallel to the many examples of Neolithic and Bronze Age monuments which are constructed in respect to such seasonal transformations. Each tunnel is also perforated with a different star constellation, which projects into the interior space during the day according to the sun angle. Far from a gallery setting, *Sun Tunnels* is never the same artwork twice, thanks to the dynamic environment of which it forms part.

Another American land artist, Robert Morris, designed the installation called *Observatory* (1970), built in the Netherlands, which similarly incorporated celestial alignments in a construction that was more overtly akin to a prehistoric ritual monument. From the inside of a large circular embankment - constructed of concrete, wood, and earth but reminiscent of a stone circle or henge-type Neolithic structure - the solstice sunrise and sunset can be observed aligned with notches in an outer ring. As with *Sun Tunnels*, *Observatory* is intentionally an ever-changing artwork, which is in part formed by the natural rhythms of changing seasons and times of day. Such awareness of the environment has proved formative in the archaeological interpretation of many prehistoric ritual sites. Lippard suggests that, rather than making a direct appropriation, Morris instead reimagined a way of thinking about landscape, one that is evidenced in the archaeological record but less common to the modern everyday:

> "Of course Morris was not trying to reproduce an ancient temple; he was making a sculpture that gained a dimension by *referring* to the past from his own point in history" (Lippard, 1983: 110)

Land artists aimed to disrupt the dichotomy between nature and culture by reverting to a closer relationship with the land that we associate with ancient peoples (Lippard, 1983: 5). As Lippard points out, such a relationship is inevitably situated within a contemporary context. The ideas of the movement were in part framed by the politics of environmentalism that emerged in the 1960s. Rigaud points out that while Land Art is considered part of a disruptive "avant guard" it also "envisioned the land from an overtly romantic perspective" (2012: 1). As such Land Art could be seen as part of the Romantic art tradition which aims to reinforce personal and emotive connections with nature and a nostalgic view of the past. Just as Romanticism originally stemmed

from a reflex to post-Enlightenment Modernism and the rationalisation of nature, so the Land Art movement was in part a reaction to what was seen as a reductive relationship with nature in the Twentieth Century. As we have seen, the ambitions of those involved in the movement go beyond a desire for a Romantic gaze upon the natural world however. Where Land Art stands out from other art forms is where it situates such discourse within the environment itself.

Artists in Britain such as Richard Long, Andy Goldsworthy and Chris Drury also built artworks which are integrated with, and part of, nature. Unlike the large scale landscape interventions of Smithson, Holt and Morris, these artists produced smaller works through many hours of personal labour, weaving and building installations from materials available in-situ. Their ideas and methods were inspired by indigenous practices outside of Western traditions, as well as by the materials and built heritage of prehistory. The artworks are often ephemeral, surviving only in photographs. The ritual, or performance, of making - an interaction between artist and environment – here becomes as important as the resulting material works themselves.

Tilley et al. (2000) suggest that while archaeologically inspired artwork "works at a very generalised level", the way in which Land Art can instigate new relationships with landscape might be useful to archaeology. They draw analogies between the hands-on nature of archaeological excavation and the tacit familiarity that land artists such as Goldsworthy develop with their found materials. By "performing art", as they describe it, Tilley et al. are able to explore the experiential and aesthetic significance of prehistoric monuments and landscapes that standard archaeological practices are ill equipped to express (2000: 60). It is the process, or performance, of producing artworks that they are interested in. Their experiments demonstrate how alternative engagements can offer archaeologists a way to reconsider familiar sites, particularly in a landscape context. Without the benefit of the articulated visual language that comes from sustained artistic practice, the outcomes of such work are unlikely to communicate well to others however, as they themselves acknowledge (2000: 44). Both artistic and archaeological practices are interested in observing the world through tacit engagement. They are also both concerned with materiality and the relationship between person and environment. Despite these significant crossovers, the processes behind them and the types of contributions to knowledge that they can make are quite different. In the author's view the diversity of these contributions should be celebrated, and the different perspectives they offer can at best complement each other in an interdisciplinary context.

The Land Art movement coincided with a shift in attitudes toward the environment that occurred in the latter half of the Twentieth Century. After the Enlightenment, the natural world was seen on the one hand as a resource to be measured and controlled for the benefit of human progress. On the other hand it was viewed through a Romantic gaze, such as in landscape painting, as a world of picturesque beauty. Both views - the Modern and the Romantic - served to reinforced the dichotomy between nature and culture. In short, the environment was regarded as something to be managed and overcome. This attitude changed - perhaps due in part to the dissemination of images from aircraft and spacecraft as discussed in chapter one - towards a new paradigm of environmentalism where nature could be a protagonistic force with a will of its own. Despite its Romantic inheritance (Rigaud, 2012: 1) the Land Art movement aspired to a new model of environmental art where both the land and the artist engaged in a process of co-creation. The ideology, if not the actuality, of this notion has had broad reaching implications, including in archaeological practice. It corresponded with a way of engaging with landscape - through overtly subjective, personal experience - which had already been legitimised by continental philosophers such as Heidegger and Merleau-Ponty.

4.4 Post-processual landscape archaeology

When Tilley et al. (2000) set out to reasses the archaeological landscape of Bodmin Moor through the creation of artworks, they were not only building on the activities of Land artists but also on the new approaches to landscape archaeology that they themselves had helped develop in the mid 1990s. Often described broadly under the term *phenomenology* this approach foregrounded lived experience, and brought into question the methods traditionally used to survey and record archaeological landscapes. Critique of traditional scientific methodologies had begun during the previous decades with a shift towards *post-processual*, or *interpretive*, archaeological theory. This theoretical framework recognised the difficulties in attempting to understand prehistory through Modern eyes. A paradox existed whereby the rational, scientific methods that were the foundation of archaeological practice were seen as ill-equipped to deal with the irrational and subjective nature of the diverse material culture being studied. Post-processual archaeology instead emphasises the subjective nature of archaeological interpretation. Drawing ideas from anthropology, postmodernism and feminist theory, archaeologists acknowledged that a truly objective observation of past cultures was impossible. This is because as modern observers we bring our own cultural baggage to our observations. The pursuit of objective understanding was considered by some to be both aesthetically “impoverished” and implicitly Western, Modern and gendered (Thomas, 2004). With post-processual theory came a focus on local, “insider’s

knowledge" (Tilley, 2004: 185), and a more individualistic and introspective approach to understanding landscape which approached concerns more common in the art world (Vianello, 2009: 10-11). Despite criticism that such ideologically-driven practice is incompatible with empirical evidence and academic argument (Flemming, 2005; 2006), these ideas have had widespread uptake in landscape archaeology (Brück, 2005; Gillings, 2010). Eventually, artistic practice - such as that engaged by Tilley et al. (2000) - would be explored as a way of re-envisaging landscape that could be useful in archaeology. The perceived relevance of creative practice in this pursuit came about through a shared interest in aesthetics and a phenomenological understanding of material and landscape.

4.4.1 Landscape visualisation and GIS

A contributing factor to the adoption of phenomenology in the mid 1990s was that this was a time when digital tools for survey and recording, such as geographic information systems (GIS), were rapidly gaining ground. This posed a problem for British landscape archaeologists who were interested in the qualitative aspects of the prehistoric sites they were investigating. "Quantification, mathematisation and computer modelling", Tilley comments, "seemingly offered unlimited potential for unravelling the spatial fix of human affairs" (1994: 9). The problem identified by archaeologists like Tilley was that a contradiction existed between the quantitative promise of such methods and the cultural context surrounding the images that they produced. By concentrating on the aspects of archaeology that were strictly measurable, such studies were already imposing their own rational interpretation that was devoid of "the relationality that renders things meaningful" (Thomas, 2004: 201). This contradiction between the *quantitative* tools for recording and processing data and the *qualitative* ways in which meaning is drawn from that data is implicit in most forms of data visualisation. This is because, no matter how empirically accurate the data, it is impossible to see images outside of the context of visual culture.

GIS has been used in an attempt to map out the possibilities of human engagement with landscape, such as by calculating viewsheds (Llobera, 2004; Cummings, 2008) and areas of land use (Van Hove, 2004). Such attempts to understand landscape through mechanical means and Cartesian vision are considered by some to be distanced from the nuances of embodied experience, and the importance of this experience in shaping meaningful engagements with place. This view maintains that the significance of ancient sites and landscape can best be interpreted by physically walking amongst said landscape, not by studying digital maps. This approach was identified by some under the term *phenomenology.*

4.4.2 Phenomenology of landscape

Phenomenology was the name given to an approach to landscape archaeology that concerned itself with what was missing from technological survey, namely “things as they are experienced by a [human] subject” (Tilley, 1994: 12). This approach was facilitated by post-processual archaeological theory, prompted by a resistance to digital survey methods, and inspired by the writings of continental philosophers such as Heidegger and Merleau-Ponty. Some archaeologists studying built heritage, and its relationship with landscape in particular, concluded that their interest was in understanding human experience. They looked to phenomenological philosophy to help shed some light on this area. These thinkers proposed that rather than the natural world existing *out there,* in an external space that could be empirically observed from a distance, environments are instead formed by a relational correspondence between embodied experience and the components of place. This offered an alternative to the subject/object divide that had previously dominated post-Enlightenment worldviews (Brück, 2005: 46). Such a view foregrounds embodiment, because in this model individual experience is related to the very formation of not just the self but also the environment. Perception was no longer seen as a trivial hindrance to rational observation but instead recognised as a fundamental component of the world we know. In short, relational interactions and lived experience are, in a phenomenological sense, more important to landscape than cartography and vision alone.

In his book *A Phenomenology of Landscape* (1994) Tilley outlined how these theories might be put into practice in landscape archaeology. By using phenomenology to critique existing ways of understanding place (1994: 22-26) Tilley builds a premise for investigating archaeological sites through his own lived experience of them, with particular focus on how movement through the landscape can be structured into narrative (1994: 27-33). These ideas had a significant impact on archaeological practice and inspired other archaeologists to reconsider sites in a new light (Brück, 2005: 47). Despite the experiential focus of these investigations, site plans, viewshed maps and photographs remained as visual means of illustrating phenomenological findings. In an attempt to address the issue of how to represent phenomenological research, alternative illustrative styles were experimented with. Thomas (1993), and later Bradley (1998) and Watson (2001), used reconstruction drawings from particular panoramic viewpoints, in addition to site plans, to speculate upon the arrangement of monuments and landscape based upon grounded observations. Cummings et al. responded to what they saw as the “disjuncture” between “abstract spatial devices, such as maps”, and a wish to “convey subjective observations” in a novel form of visual representation (2002: 58). By placing site plans of individual chambered tombs within a

circular representation of the skyline visible from each, they hoped to represent their "subjective, phenomenological" findings within an "empirical system of representation" (2002: 68). Brück agrees that such methods can represent landscapes "from the perspective of lived experience in contrast to the abstract totalisation of traditional photography", but warns against claims that such images are "objective records" of archaeological findings (2005: 52).

Peterson notes that the grounded perspectives and subjective observations preferred by phenomenological archaeologists bear a resemblance to the observations and drawings of the prominent Eighteenth Century antiquarian William Stukeley (2003). Gillings (2010) cautions against making such an association. In his view the Landscape Phenomenology proposed by Tilley offers a platform for archaeological enquiry that is both theoretically and philosophically robust. This bears no resemblance to Stukeley's "antiquarian ruminations" (2010: 61). Stukeley was working in a post-Enlightenment context and responding in part to a Modern desire for scientific recording, but also partly driven by a Romantic fascination with superstition and the occult. His highly speculative attribution of specific Druid ritual to the landscapes of Stonehenge and Avebury attest to this, as does his association of Christianity to prehistoric monuments (seen for example in his distortion of the Callanish Stones into the shape of a Celtic cross). Stukeley was making images before archaeology had firmly established the need for scientific integrity in the study of the past, and was presumably unconcerned that he might be projecting his own socio-political worldviews onto his observations of prehistory. By contrast, the subjectivity that is of interest to phenomenological archaeologists is born out of an explicitly Postmodern, and therefore in principle *self-aware*, concern with moving beyond rational objectivity. If the surface similarities between these Romantic and Postmodern representations are of note beyond their shared interest in subjective experience, it is perhaps because they reveal a lack of a mature visual language suitable for the illustration of phenomenological concepts. This issue has been tackled on a number of fronts.

One problem with visually representing phenomenological research is that such methods do not take into account the multisensory nature of experience. Thomas argues that the "Ocularcentrism of Archaeology" is a product of the dominance of vision over the other senses in the Western philosophical tradition (2008). "For ironically, although we study tangible material things", says Thomas, "we do so primarily through visual means: charts, diagrams, graphs, maps, drawings, photographs, and descriptions of appearance" (2008: 2). He goes on to suggest that this ironic tension is a result of Cartesianism, which divides the subjective interior world of feeling from the

outside word of objects. In the eyes of phenomenological philosophy, no such subject/object boundary exists (2008: 8). Thomas outlines the dilemma and the need for conceptual tools to better integrate vision into a more “holistic” way of representing space, but leaves the precise nature of such tools open to interpretation (2008: 10).

The capacity for creative practice to engage with multisensory experience has drawn the attention of some archaeologists seeking tools for dealing with phenomenological concepts. Inspired by the foray into Land Art undertaken by Tilley et al. (2000), Gheorghiu suggests taking these theories into serious practice and has pioneered approaches which combine experimental archaeology with creative practice including performance and Land Art (2009: 24-25). His approach is notable because it involves practitioners from across disciplines including art, design and archaeology. What these approaches have in common is a response to the sense of “deep” place that comes with spending time within a landscape. To Gheorghiu the act of engagement, in creating a temporary piece of Land Art for example, is as important as the outcome. All of these attempts to respond creatively to the experience of archaeological sites encounter the same problem: how to record a temporal, embodied and multisensory experience through the limited means of text, image and audio-visual recording.

4.5 Solutions in creative practice

So far this chapter has explored some of the theoretical terrain that has surrounded the intersections between creative practice and archaeology. This context is important to establish as it forms the fundamental framework within which archaeological visualisation operates today. Theorists have identified the limitations of the distinctly Modern paradigm which has historically dominated the visual representations of landscape and archaeology (Thomas, 2004), and suggested that greater “self-reflexivity” in archaeological image-making would be beneficial (Moser and Smiles, 2005: 6). The following section will explore how these ideas have been put into practice, with particular focus on the methods that will be adopted in the author’s own research-practice: photography (with specific focus on the aerial view), reconstruction (in collaboration with archaeologists), and moving image (as a platform to combine the other methods). It will be suggested that while theoretical and philosophical enquiry is key to understanding the issues and defining the aspirations of contemporary practice, solutions to the problems outlined here lie in creative practice itself.

4.5.1 Temporality, embodiment and photography

Ingold's 1993 paper *The Temporality of the Landscape* had a significant impact on landscape archaeology and the interpretations of what a phenomenological approach to landscape might mean. In it, he suggested that human activities over time shape the perception of landscape. He called the space where this interaction takes place a "taskscape" and suggested that traditional nature/culture divides are inadequate for understanding such places. Instead, Ingold proposed the adoption of a "dwelling perspective" which takes into account "knowledge born of immediate experience, by privileging the understandings that people derive from their lived, everyday involvement in the world" (1993: 152). These compelling ideas had major connotations for those across disciplines who were interested in better understanding the relationship between people and place. Central to Ingold's argument was that there was no possibility of separating landscape from the passage of time and embodied experience. Contrary to some theories of cognitive mapping, he maintains that cartographic maps are quite different to the concepts of geography that we build as we bodily travel through a landscape (2000: 219-242). We experience the world through movement, whereas in "the cartographic world, by contrast, all is still and silent [...] there are no variations of light and shade, no cloud, no shadows, no reflections" (Ingold, 2000: 242). A concern for the formative role of these dynamic aspects of landscape is shared by landscape archaeologists. Despite this it is difficult to avoid "fixed" methods of visual recording. While discussing the virtues of three-dimensional "environmental" Land Art, Tilley et al. suggested that the two-dimensional artwork is limited in how it can represent landscape in that the "point of view or perspective on the landscape, the light, the colours and textures [all] become fixed" (2000: 41). This section will examine the extent to which these attributes apply to photography, and suggest ways that the *ocular and static* photograph can in fact respond to the *multisensory* experiences of a *dynamic* landscape.

Shanks acknowledges the temporal limitations of the photograph in archaeological recording. Photographs, he says, fix a particular "ephemeral" moment as much as they record the remains of the past (1997: 86). What he describes as the "texture of their detail" forms a "partially involuntary record" of the present in which the photograph was taken (1997: 100). While this might be considered a hindrance to scientific recording, it could be a useful attribute elsewhere. Shanks insists that the "fascination of the photowork is that it attests to so much sensory experience" (1997: 100). According to Shanks the photograph can thus escape categorisation as a medium that solely promotes ocularcentrism, and yet some photographs - the map-like vertical aerial view for example - undoubtedly remain far removed from any inference of lived experience. The extent

to which embodiment plays a part in the image depends then on the nature of the photograph, the intentions behind it, but also the “involuntary” tendency for images to take on a meaning of their own. Bohrer describes this as a fusion of “objectivity and invention” or “factuality and force” (2005: 182) that exists within the photograph. The framing and lighting of even a strictly documentary photograph reveals an aesthetic world that is read through the eyes of visual culture. Such interactions inevitably evoke the experiences of the photographer.

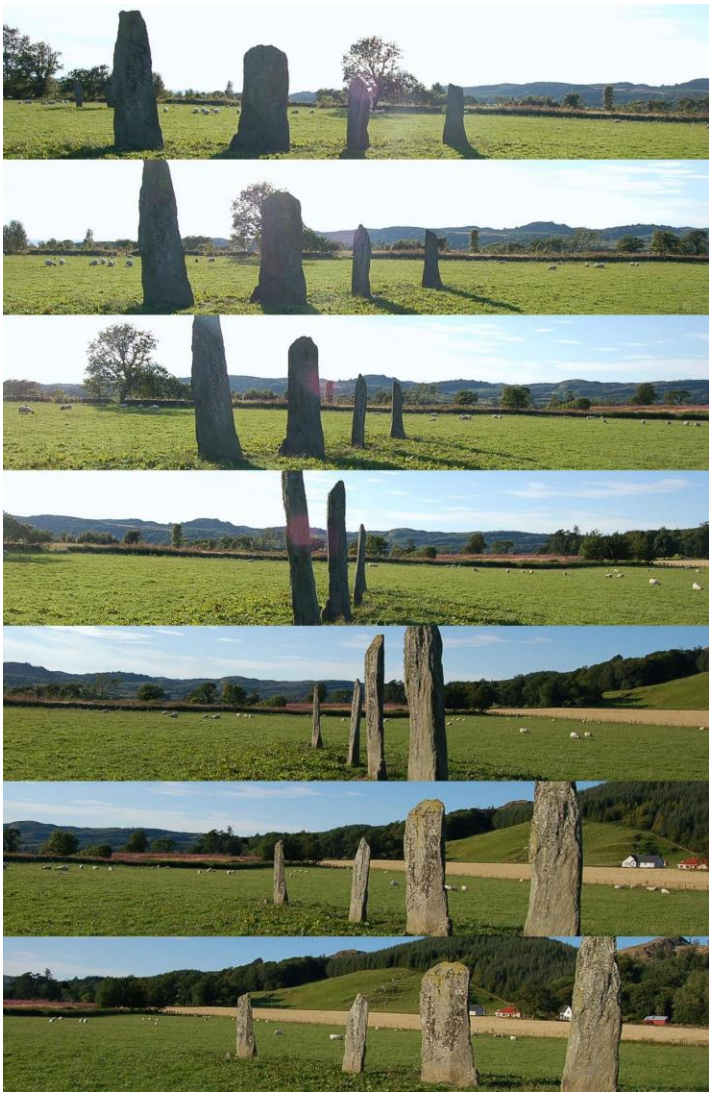


Figure 4.1 - Frames from a “Trans-scape” animation of Ballymeanoch standing stones, Aaron Watson, 2008. © Aaron Watson, used with permission.

Aaron Watson has explored these photographic possibilities within an archaeological context. Watson argues that traditional methods of archaeological recording can serve to reinforce the nature/culture divide, reducing the embodied and subjective in favour of static representations,

“devoid of sensory experience, movement, change and transition” (2004: 80). He proposes creative approaches to image-making and photography that might act to subvert traditional modes of visualisation. Photomontage is used to respond to the three-dimensional and temporal aspects of sites and landscapes, which are “constantly transforming in subtle ways” (2004: 91). Watson’s approach draws upon the visual modes of Cubism where multiple perspectives can be shown simultaneously, demanding an active engagement by the viewer. The potential for photography to depart from a single, static view was demonstrated in the artist David Hockney’s photomontages, and it is these possibilities that Watson explores within an archaeological context (2004: 92).

Beyond this, Watson has employed animated sequences of photographs - made whilst walking through sites and landscapes - that he has termed “trans-scapes” (2008: 141, figure 4.1). These animations are concerned not only with representing multiple perspectives but also with incorporating the act of walking into the image. Drawing inspiration from the “walking” artworks of Richard Long, and the concept of place that Ingold describes as an intersection of “paths of movement” (2007: 2), Watson’s “trans-scape” animations respond to his own walking engagement with the landscape. By juxtaposing these creative approaches with more traditional methods for archaeological recording Watson aims to challenge the orthodoxy of archaeological vision by the means of practice. Of particular interest is the extent to which embodied experience can be incorporated into visual outcomes. Mithen describes how Watson's mixed-media response to archaeological landscapes can transmit an impression of his lived experience:

> “His presentation concerned Avebury and involved a combination of exquisite photographs, lecture and performance [...] I was left with a better appreciation of how he has experienced the Avebury monument on his many visits.” (Mithen, 2004: 166)

While to Mithen the question is then whether this constitutes an archaeological or artistic contribution, what is of interest here is the successful communication of Watson’s experience of place - accumulated over time - using textual and visual media. His work demonstrates the potential for a post-Cubist visual language to challenge the argument that two-dimensional representations are necessarily static and fixed. “Trans-scape” animation also demonstrates the ways in which moving image can respond to embodied interactions with place. These transformations are made possible by creative practice.

4.5.2 Grounding the aerial view

If photography can, as Bohrer (2005) suggests, create a tension between static and distanced visual representation on the one hand, and the dynamic and visceral nature of lived experience on the other, then aerial photography would seem all the more likely to do so. Writer and aerial reconnaissance pilot Saint-Exupéry's statement that "[the] aeroplane has unveiled for us the true face of the earth" (1939: 63) reveals a widely held belief current with the air-mindedness and modernisation of his time: that the totalising view from above was a truer representation than the grounded view. Smyth (2014) maintains the opposition between Merleau-Ponty's existential phenomenology and the "absolute perspective" represented by the writings of Saint-Exupéry, who is cited in Merleau-Ponty's works. This suggests a potential incompatibility between aerial and phenomenological worldview, that has been noted within landscape archaeology (Thomas 1993: 27; Tilley, 2008: 272). Site plans, distribution maps and GIS are all methods of archaeological representation that provide a de-situated projection looking down upon the Earth's surface. These media tend towards a mode of abstract Cartesian representation that is at odds with the phenomenological concerns expressed by some landscape archaeologists (Cummings et al. 2002, Brück 2005, Tilley 1994). While aerial archaeology has been responsible for the discovery and interpretation of many sites across Britain, much of our understanding of British prehistory has been shaped by grounded observations.

Figure 4.2 - Aerial photograph of Castlerigg stone circle taken from light aircraft. Photograph by the author.

Figure 4.3 - Ground level photograph looking out from Castlerigg stone circle to the landscape beyond. Photograph by the author.

For example one interpretation of the placement of stone circles in Britain relates them to the surrounding landscape as seen from standing within the circle: "a well-known stone circle like Castlerigg seems to crystallise the characteristic features of the landscape in which it is built" (Bradley, 1998: 135). A high-level aerial photograph of Castlerigg stone circle in Cumbria records the precise placement of the stones - and can even show up subtle features like the surrounding earthwork remains of early-modern rig and furrow farming - but reveals little of the most significant interpretations of the site, related to its placement within the landscape (figure 4.2). The way in which larger stones juxtapose the high mountains on one side of the monument while smaller ones are set against lower hills on the other is best observed from inside the circle (figure 4.3). Similar correspondences are found at stone circles across Britain (Watson, 2004: 88).

Is it possible then to create photographs that respond to lived experience - as Shanks suggested (1997: 100) - from the air? Bearing in mind that the aerial perspective bears little resemblance to the more familiar grounded view, its application within a phenomenological context has been questioned (Tilley, 2008: 272, Thomas, 1993: 27). While noting that the "comprehensive" aerial view can be a useful and inspiring vision, Macdonald cautions that:

> "It may be a dangerous delusion if the process of 'drawing back' results in a loss of human awareness of those things that may only be appreciated from close to, or when 'grounded' or 'immersed'" (Macdonald, 2004: 53).

While the static aerial photograph might result in a "god-like" detachment from bodily experience, this is often at odds with the viscerally intense experience that comes with aerial photography in practice, as Macdonald goes on to say:

> "Ironically, the experience of flying in a small, light aircraft, immersed in and sensitive to every perturbation of the air due to weather or terrain, despite the 'god-like' perspectives it may afford, is at the same time a very effective reminder of human vulnerability [...]" (Macdonald, 2004: 53)

In chapter two, a number of artist-photographers - including Bridges, Gowin and Macdonald - were discussed who endeavour to respond to their own multisensory experience while working with the aerial view. "I am up there to *experience* the site", says Bridges, "I hope to communicate that experience through photography" (2006: 67, original emphasis). These accounts not only

agree with Shanks' statement that art-photography does indeed respond to "sensory experience" (1997: 100), they also suggest that this experience is equally relevant to the aerial photographer.

For most artists who use the aerial view, the inherent tension between distance and intimacy - or strangeness and familiarity - is key to the potency of their work. That is not to say that all aerial photographs are endowed with an implicit connection to immersive lived experience. Some views, particularly high verticals, offer little or no frame of reference that connects them to life on ground level. Aerial photographers and artists have used various means to mitigate the strangeness of the view from above and to ground it with more familiar experiences. These include adopting the oblique view, using the sensations of movement or vertigo, and including recognisable features amongst otherwise abstracted landscapes. Beyond this aerial photographs are unavoidably embedded with their own meaning, either explicitly or implicitly, which is interpreted through visual culture. As suggested in chapters one and two, the resulting photograph also implies the presence of the airborne photographer and alludes to a set of experiences that build upon the viewer's prior understanding of both landscape and flight. It is suggested here that aerial visualisations sensitive to this cultural context could provide a powerful platform for public engagement in archaeology and heritage.

4.5.3 Interpretation for public engagement

As we have seen, there has been much theoretical debate about the epistemological functions of archaeological enquiry, and its relationship with certain forms of image making. This debate tends to be directed at images created during the process of archaeology, such as site plans, aerial photographs and distribution maps. In contrast there has been little effort made to connect the images produced for public outreach in archaeology to these theoretical debates. Instead, discussion around public outreach in archaeology is more often framed around issues relating to the authority of the image and the representation of uncertainty that CGI and VR technologies have raised (Roberts and Ryan, 1997; Denard, 2012). One of the reasons for this is that while archaeologists are responsible for creating images during the archaeological process - such as site plans, sections etc. - the creation of images for public engagement is often passed on to creative practitioners with no archaeological background. In this relationship the archaeologist is responsible for ensuring that the archaeological record - and the uncertainty surrounding it - is appropriately represented, but is less likely to be concerned with style and aesthetic, which is often left to the artist. In addition, theoretical analysis of the aesthetics of archaeological images produced for public interpretation has been obscured in the last few decades by the predominance

of computer science - with its own research criteria - in archaeological visualisation projects (Earl, 2005). Where aesthetics are considered in such research it is often in terms of technological capabilities - such as the capacity for hyperreal rendering (Cox, 2015) or interactive interfaces (Zuk, 2005) for example - with little sustained enquiry into the meaning of particular images in the context of contemporary visual culture. Watterson calls for creative visualisation practitioners to engage more with archaeological research and argues that such methods can play an active role in the interpretive process (2014). This follows on from the arguments of archaeological illustrators like James, who advocates the use of reconstruction drawing not only as a method of communication but also as a research tool within archaeological practice (1997: 27). While some archaeological practitioners are positioned to explore creative practice as an archaeological field method (for example Gheorghiu, 2009; Watterson et al., 2014; Watson, 2004; 2008), individuals and collaborations that truly fuse archaeological method and creative practice are few and far between. This is because each discipline comes with its own language - both visual and textual - and as such interdisciplinary research often necessitates sustained practice in both fields. It is not the intention of this thesis to contribute to archaeological research methods however, but rather to propose ways of improving public outreach for archaeology. This follows a long tradition of creative practitioners who have positioned themselves outside of the archaeological discipline, but who engage in collaborative projects which aim to communicate archaeological narratives to a broader public.

Allan Sorrell was a key pioneer of the creative visualisation of archaeological sites in Britain. His paintings and drawings hail from the artistic discipline but also respond sensitively to the archaeological material and interpretations. Sorrel argues for the necessity of “humanistic” perspectives in archaeology, “rather than the precise formulation of factual information that is technology” (1981: 21). While insisting that precision is paramount, Sorrel prefers the fidelity of drawing from human observation, rather than the mechanical accuracy of the photograph (1981: 24). His images display a careful balance of architectural clarity and theatrical drama enhanced by atmospheric lighting and weather. The figures that populate Sorrel’s reconstructions are suggestive of the activities and human stories that may have taken place. Sorrel insists that this human presence, more than simply providing scale, gives a sense that these were “dwelling places of people very much like ourselves” (1981: 21). While exclusive focus on the similarities, rather than the disparities, between modern and prehistoric culture would surely be contested by contemporary archaeologists, the ambition to visualise relatable “dwelling places” remains very much of interest in archaeology today.

Despite his interest in human activity, the vast majority of the reconstructed images adopt an oblique aerial view. “A high viewpoint”, says Sorrel, “has much to commend it” (1981: 24). The predominance of the elevated view could be attributed to the time in which he was working, when aviation was already reshaping ways of seeing landscape in Britain. Sorrel worked as a camouflage officer during World War Two, during which time he painted visualisations of Royal Air Force (RAF) bases from above with the same pictorial sensitivity that he brought to archaeological reconstructions (Gruffudd, 1991: 21). Exposed to RAF operations, the potent and revealing nature of the aerial view must have been as tangible as it was topical. To Sorrel at least the aerial view was compatible with his humanistic, non-technological approach to archaeological visualisation.

4.5.4 CGI and moving image

As computer graphics became more widely available in the early 1990s, CGI was adopted as an alternative method for reconstructing and visualising archaeological spaces. Early discourse of this new medium was concerned with the apparent precision of CGI, and the notion that its appearance afforded undue authority to the resulting images compared to the explicitly interpretive appearance of painting and drawing (Earl, 2006: 174). Hand-drawn visual styles continue to be used to signify the presence of subjectivity and speculation within interpretive images. This is despite the explicitly crafted nature of CGI, which is still considered by some to automatically ascribe notions of factual accuracy. Consideration of the relevance of such concerns within the sphere of public engagement - particularly in the context of the visual language of cinema discussed in chapter three - have been obscured by debates about the scientific integrity of CGI as part of the archaeological research process. The London Charter initiative exemplifies the concerns raised when computer graphics are applied as an archaeological method. It identifies the need for transparency and accountability in line with academic standards of “intellectual integrity” (The London Charter, 2009: 5). To suggest, as the London Charter does, that academic outputs and material created for public dissemination should by necessity be measured under the same set of criteria is both impractical and insensitive to the possibilities of interdisciplinary practice. Images function only within specific contexts of viewing. Sorrel’s paintings are not likely to be mistaken for scientifically verifiable records and neither are CGI reconstructions produced today, outside of an academic context and for consumption by a public audience. Where the principles of the London Charter are important is where digital modelling is used to record or generate new archaeological knowledge, or to support archaeological interpretations within an academic context. In predictive lighting for example -

where computer-generated rendering is used to visualise how archaeological sites might have looked under past lighting conditions - the need for transparency in the form of metadata and paradata is clear if the results are to be taken into account in archaeological interpretations (Devlin et al., 2002: Happa et al., 2010).

This thesis is not concerned with the generation of new archaeological knowledge however, but rather improving ways for archaeologists to express their interpretations outside of the discipline. While there is a need to authentically represent the evidence and speculation behind archaeological images, interpretation for a public audience is not the same as the interpretation that happens within archaeological investigation and discourse. For public outreach to be successful, archaeological narratives need to be told in a compelling way, in a language shared by a lay public. In the author's view, a visual language that is simultaneously sensitive to the symbolic meanings of visual culture on the one hand, and to the accountability required by scientific method on the other, is neither viable nor necessary. Instead of conflating these two contexts of viewing it would be more productive to better understand the demands of each, and how the implications of transparency/integrity differ in each case.

In public outreach the priorities lie in effective communication, and this is commonly reflected in the involvement of media professionals and creative practitioners when such content is generated. In broadcasting however, Earl points out that production requirements often limit the extent to which visualisation for the public is a truly interdisciplinary process. This not only limits the archaeological integrity of CGI reconstructions, but also constrains the extent to which the style, format and theoretical background of presentation can be properly considered (2005: 207). The ways in which the interests of archaeologists, creative practitioners and producers are, and could be, coordinated to create compelling and representative visualisations for the public is, Earl suggests, woefully under-researched. Despite this there are many examples of successful collaborations in this area.

Some media companies specialise in producing content for the heritage sector, such as York based firm *ay-pe*, who produce film, animation and visual effects for museums and visitor attractions. One such film, produced for the English Heritage visitor centre at Housesteads Roman fort on Hadrian's wall, incorporates CGI reconstructions combined with aerial footage taken from a helicopter. As with Sorrel's paintings and drawings, such visualisations attempt to show the three-dimensional structure of the reconstructed architecture while also including the weather and

landscape to evoke a sense of atmosphere. In addition to providing a better sense of three-dimensional space, the previous chapter (section 3.3) also suggested that in film the flying camera affords the viewer a sense of bodily engagement and free agency above the landscape. While creative practice is uniquely positioned to engage with such considerations within the cultural context of viewing, it is rarely underpinned by academic theory. This is partly due to the difficulties of interdisciplinary research as well as to the disparities between visual culture and the computer science that has dominated debates around CGI.

4.6 Summary

In a post-Enlightenment Modern worldview, landscape could be seen either rationally or Romantically. As the scientific disciplines - including archaeology - matured, cartography began to lose its artistic components and a formal language emerged for measured drawings and site plans which endeavoured to visualise the landscape with a rational objectivity. Meanwhile creative practice began to fill the gaps, with the Romantic Art movement and its descendants reacting to what was seen as the inhumanity of such a mechanised worldview. The Romantics saw nature as something irrational that should be revered because of its mystery and beauty. Landscape was the object of their explicitly subjective observations. In such a view, man was uniquely placed to appreciate the as-yet untamed beauty of nature. The visual modes of Romantic Art were dominated by male gaze, and operated within a Modern paradigm whereby human ingenuity and the sublime could transcend the natural world.

Archaeologists like Thomas acknowledge that the epistemological conventions of archaeology have been deeply rooted in modernist thinking. The advent of post-processual archaeology opened up the possibility for aesthetic understanding to be reintegrated into archaeological practice. Rather than return to Romantic visions of the materials and landscapes of the past, a new wave of archaeologists suggested that alternative engagements were possible in the context of phenomenology and Postmodern paradigms. These efforts have reunited the disciplines of art and archaeology under an aspiration to explore the role of lived experience in our formation of knowledge about landscape.

This chapter has argued that aerial photography and CGI do not necessarily fall under a strictly Modern paradigm of vision simply by virtue of their technological nature, but can operate within different contexts of production and viewing. All image-making methods have the capacity to incorporate the “ethical, political, rhetorical and aesthetic dimensions” that Thomas maintains are

so important to contemporary archaeological understanding (2004: 224). As shown in chapter one, even the most scientific of images cannot escape subjective implications within the context of visual culture. Creative practice differs from scientific practice because it endorses and exploits the subjective meanings of images for its own ends. Chapter two demonstrated the capacity for the aerial view to express political, emotional, personal and experiential feeling despite its apparent distance and ocular nature. Chapter three explored how realism in new media extends beyond plastic appearances and how CGI can incorporate sensational, subjective, social and mythological realities into virtual worlds. Discourse of CGI within archaeology has sometimes conflated very different applications of the technology. Investigations that use digital survey, mapping and modelling to uncover new archaeological knowledge using scientific methodologies bear little resemblance to the ways in which digital technologies have been used in creative practice, which tend to focus on the illusionary and subjective nature of CGI.

The previous chapter (section 3.2.1) noted the connection between contemporary visual effects and Nineteenth Century stage magic. Cinematic images should be considered as much related to illusion and the uncanny as they are an accurate representation of the real. Such approaches to CGI are largely opposed to the mantra of scientific integrity in computer modelling, such as that laid out by the London Charter (2009) for example. In the author's view these disparate fields should not be conflated by virtue of their shared technologies. Further to this it will be argued that - despite the concerns of landscape archaeologists (Tilley, 2008: 272; Thomas 1993: 27; 2004: 198-201) - experiential dimensions can be explored and expressed using aerial and digital visualisation technologies in the context of creative practice. The following chapter will outline the methodologies by which these ideas will be exercised and demonstrated in practice.

Chapter 5 - Methodology

5.1 Introduction

So far a number of types of aerial photography and digital media have been discussed, from instrumental images to artworks, each of which visualises landscape heritage in a particular way. While these images share a technological premise - relying on the hardware and software of photography, flight and computer science - the approaches behind their production, and the cultural meaning of the outcomes, vary enormously. In the last chapter a concern with the lived experience of landscape heritage was introduced that has been central to the formation of contemporary approaches to landscape archaeology. Critique of the images used in archaeology has been central to this debate. The way in which "static, abstracted" cartographic practices, such as geographic information systems (GIS), have influenced our understanding of landscape heritage has been recognised as insensitive to the "dynamic complexity of many past social landscapes" (Gillings and Goodrick, 1996). Digital modelling, particularly in the context of survey, has to some extent inherited Modern ocularcentric and Cartesian modes of vision that are distanced from lived experience (Thomas, 2004; 2008). At the same time the possibilities for bodily immersion and storytelling in VR and CGI have been recognised as a good fit with phenomenological concerns (Gillings, 2005: 229). It is in this area that this research aims to make a contribution from the perspective of creative practice and in response to what Earl recognises as a shortfall of research in interdisciplinary archaeological visualisation for a public audience (2005: 206).

"[W]riting about art", says Cazeux, "is, in comparison to making the stuff, such a sedate occupation" (2006: 43). As such the author will take on the role of research-practitioner in order to both learn by doing, and tell by showing. The written component of this thesis sets the practice within its theoretical and philosophical context. The ways in which this context has defined the intent, and the resulting aesthetic approach adopted by the research practitioner, is expanded upon in section 5.3.4. The practical element will follow the hypothesis that creative practice can play a critical role in bridging the gap between visualisation technologies and the lived experience of landscape heritage. An approach to visualisation that is oriented around creative practice, it will be argued, is able to incorporate the experiential (dynamic and multisensory) aspects of landscape into the images (fixed and visual) that are produced. To demonstrate such an argument textually is problematic because the outcome is related to the visual and to experience. Cazeaux

argues that writing maintains a distance between “concept and action” and states that “the descriptive sentence creates a specificity which cannot possibly be identical to experience” (2006: 49). The research-practice will draw upon the author's previous practice in aerial photography and CGI filmmaking (see for example Baxter, 2014), and allow the tacit knowledge that is generated in the field, and in the computer lab, to play a part in the research outcome. Biggs suggests that, while tacit knowledge is not necessarily ineffable and could be explored in writing, the process of creating artefacts allows for what he terms “experiential feeling” to impact upon the “experiential content” (2004: 20). This research was born out of a desire to infuse aerial and digital visualisations with the emotive sense of atmosphere felt by the research-practitioner when working within heritage landscapes. It is hoped that the visual outcomes of the research will encapsulate the potential for creative practice to respond to such experiential feeling.

5.2 The research-practice

First-hand experience is key to the research-practice. Where theoretical study can offer insights into practice from a holistic, outsider’s perspective, practice-based research can offer contributions from an immersed, insider's view. The research-practitioner’s training is in animation and digital media, and as such the discipline of archaeology remains relatively unfamiliar. As such it was important to become as immersed as possible in archaeological theory and practice, not in an attempt to become an archaeologist by proxy but rather to learn the language necessary to engage in interdisciplinary practice. Aside from informal discussions and formal collaborations (see for example Waterson et al., 2014), this involved attending archaeological conferences (see appendix D) and visiting - even participating in - ongoing excavations (figure 5.1). This involvement was a critical step in creating visualisations that were sensitive to contemporary concerns within archaeology. Learning the technical language, but also the concepts referred to in archaeological theory and practice, facilitated negotiation of the ways in which archaeological narratives were represented in the case study projects. It also expanded the range of experiences the research-practitioner was able draw upon, from the distanced aerial view to the close-up and tactile engagement of excavation.

Figure 5.1 - The research-practitioner participating in excavations at Castle Law Forgandenny hillfort. Photograph by Dr Alice Watterson, 2014.

The aerial view is by no means new to archaeology. Chapter one (section 1.5) explored what Hauser referred to as the “typography of aerial archaeology” (2007: 164), which remains relevant today (Bewley, 2003). Recent developments have seen low altitude aerial photogrammetry - using tethered aerial platforms and UAVs - combined with structure from motion photogrammetry as a method for three-dimensional survey (Remondino et al., 2011; Verhoeven et al., 2012; Green et al., 2014). The research-practice brings these methods, and to some extent the visual language, of aerial photography and photogrammetry - which are commonly used in archaeological survey - into the domain of visual effects and animation.

5.2.1 Fieldwork

The “typography” that Hauser refers to is a set of naturally occurring conditions under which archaeological features, that might be invisible otherwise, will appear from the air (2007: 164). These include “crop marks”, where variations of plant growth reveal subterranean features, “soil marks” in ploughed areas and “shadow sites”, where subtle topographical features are revealed by sunlight from a low angle, particularly when viewed looking towards the light. In addition some features may be revealed under snow cover, or patches of melting snow (Riley, 1987: 26-27).

Aerial archaeologists regularly seek out these conditions to aid the detection and interpretation of sites. This approach to aerial photography was incorporated into the research-practice (figure 5.2) and played a part in the case study projects (see section 6.3.1). Despite the instrumental aims of most aerial archaeology, the use of naturally occurring conditions to better visualise topographical features is commonly used by artist-photographers such as Gowin and Bridges (section 2.3). This is because, as well as aiding clarity, these conditions also involve aesthetic qualities, by accentuating the contrast between light and shadow for example. Identifying these areas of overlap between the visual languages of archaeology and creative practice was an important part of the research-practice. During fieldwork two types of aerial photography were used: high altitude (above 150 meters) photography from manned light aircraft, and low altitude (below 120 meters) photography from remote platforms.

Figure 5.2 - Brougham Castle near Penrith, Cumbria, with the earthwork remains of a Roman camp visible in the lower left as a “shadow site”. High aerial photograph by the research-practitioner, 2013.

For high altitude work a Cessna 172 light aircraft (figure 5.3) was chartered for a number of photography flights, in part financed by the *Historic Scotland Sponsorship Fund*. This particular model of aircraft is preferred for aerial photography because it is of the high-wing type - meaning that the wing does not obstruct the view of the landscape below - and because it has a large window that can be fully opened for photography. The photographer sits adjacent to the pilot and

directs the position of the aircraft using the intercom, or hand signals when the airflow from the open window interferes with the microphone. The speed of the aircraft (around 80 to 120 mph), the resulting vibrations, and the obstructions of view caused by the wing, strut and wheel all contribute to challenging conditions for photography.

Figure 5.3 - The research-practitioner and a Cessna 172 light aircraft used for high aerial photography. Photograph by Kieran Duncan, 2014.

One consideration during the research was how the experience of different types of fieldwork affect engagement with landscape heritage, particularly in light of the contrast between the high aerial perspective and the grounded view. The phenomenological interpretations of prehistoric sites are clearly inaccessible from the air, as discussed in the last chapter (section 4.5.2). This was experienced first-hand when comparing how sites first seen from the air were later experienced from the ground. During high altitude aerial photography the resulting images are directly affected not only by the increased distance from the subject matter but also by the physical constraints of the aircraft (figure 5.4). Stronger lenses are required which have the effect of reducing foreshortening, resulting in a view that is closer to the orthographic. This makes it harder to include the horizon - and landscape context - in oblique photographs, a problem accentuated by the obstruction posed by the wing. While these constraints might be more or less

inconsequential to the aerial archaeologist, an awareness of how they affect the aesthetics of the resulting images is crucial to the creative practitioner.

Figure 5.4 - The research-practitioner photographing from a Cessna 172. Photograph by Kieran Duncan, 2013.

Low altitude aerial photography is taken from remote platforms, meaning that the operator remains on the ground. Kite aerial photography was the predominant method used, where a camera is suspended from a kite line. Kite aerial photography was first pioneered at the end of the Nineteenth Century and has been used for a wide variety of purposes over its history, including archaeological survey (Verhoeven, 2009). In this case the camera angle and settings are usually pre-determined on the ground and repeat photographs are automatically taken every few seconds, providing adequate material for both still photography and structure from motion (SFM) photogrammetry. UAVs, or drones, were also used for low altitude work and have a number of advantages including gimbal stabilization and a high level of control, at the cost of limited battery life. Both kites and UAVs are highly dependant on favourable weather conditions meaning that a good situational awareness is necessary for safe and successful flight. The operator must keep track of what is happening both in the sky and on the ground. These remote platforms naturally involve a completely different engagement with the site and landscape. As well as allowing for a response to how the site looks and feels on ground level, low altitude aerial photography also has its own photographic constraints and possibilities. Due to the closer proximity to the subject

matter, and to aid stabilisation, wider angle lenses are more likely to be used. This has the effect of increasing foreshortening and makes it easier to place foreground details in the context of the surrounding landscape. The exaggerated foreshortening can also give a better sense of three-dimensional space, drawing the viewer into the scene (figure 5.5). Low altitude aerial photography can in some ways offer a middle ground between the high aerial and the grounded view.

Figure 5.5 - A wide angle, low altitude view of St Andrews Cathedral. Kite aerial photograph by the research-practitioner, 2013.

Landscape archaeologists, particularly in British prehistory, have become concerned with how the grounded experiences of fieldwork influence the formation of knowledge about prehistoric sites. Attempts have been made to incorporate these subjective experiences together with more formal archaeological recording (Cummings et al. 2002; Bender et al. 2007; Tilley, 2008). These approaches take into account what Ingold termed the “dwelling perspective”, which comes with spending time in the landscape (1993: 59). Watson has demonstrated how creative practice in the form of painting, photography, filming and photomontage can respond to this dwelling perspective, and better represent the lived experience of sites and landscapes (2004, 2008). In previous interdisciplinary projects the research-practitioner and collaborators considered how their own experiences might be allowed to influence digital and aerial visualisations through creative practice (Watterson et al., 2014). The practice employed here is positioned outside of the

archaeological discipline but draws from both the methods and language of aerial archaeology, and the theoretical concerns with embodied experience that exist within landscape archaeology. The central research question of this thesis - whether creative practice can bridge the gap between lived experience and the visualisation of landscape heritage - will be tackled primarily by engaging in creatively-driven aerial and ground-based photography and filming in the field.

5.2.2 Lab work

Chapters three and four explored the diverse ways in which digital technologies have been used as image-making tools in film and archaeology. In archaeology the use of digital media to respond to experiential criteria has been predominantly pursued on two fronts. On the one hand, digital mapping has been used to visualise the possibilities of embodied engagement with landscape. These methods include the computational modelling of viewsheds (Llobera, 2004; Cummings, 2008), movement and land use (Van Hove, 2004), and could be extended to include participatory GIS or "deep mapping" (Fitzjohn, 2009). Such approaches visualise human experience and activity within Cartesian space. On the other hand, some methods attempt to visualise sites and landscapes in a way that is physically closer to naturalistic experience on the ground. Predictive lighting attempts to visualise the way in which sites and artefacts may have looked under past lighting conditions, using digital rendering for example (Devlin et al., 2002: Happa et al., 2010). CGI reconstructions of archaeological sites - often referred to as "VR" within archaeology regardless of the method of viewing - have been considered as an alternative way of digitally exploring experiential possibilities (Gillings, 2005: 231). Here sites are visualised from the perspective of an imagined observer, often through interactive virtual environments that use an avatar to suggest an embodied presence for example (Colleen, 2009; Kennedy et al., 2013). Gillings questions the extent to which immersive digital models really do relate to embodied experience or instead simply represent virtual space within the format of a specific mode of vision (2005: 233).

The CGI component of this research-practice will deal in part with Cartesian representation of landscape during the data-gathering stage. For the most part however, the practice will attempt to respond creatively to the embodied experiences of the site, not through interactive environments but instead through the production of moving image outcomes that are closely related to the photography gathered during fieldwork. The aim is to draw from the visual language of cinema, rather than that of survey, architectural modelling, computer science or gaming, all of which use some of the same technologies of digital modelling. As already mentioned, there are

some fundamental differences between the approaches towards CGI used in film and those used in other fields. This is in part due to the legacy of stagecraft that still exists within cinema, and partly due to its inheritance from the field of photography. These differences can be characterised by the foregrounding of the viewer's perspective - or camera space - over Cartesian space. In film it can be more useful to separate space into foreground, middle distance and background - relative to the camera - than to consider elements arranged relative to a grid. This is because the on-screen image is paramount. This difference has resulted in CGI software such as *Autodesk Maya* - the industry standard in animation, visual effects and film - interpreting the X and Y coordinates on a vertical plane consistent with camera space. The majority of CGI software platforms instead interpret X and Y on a horizontal plane as would be expected on a map or plan drawing, a legacy from architectural applications which prioritise world space. In order to better respond to photographic composition made in the field, the CGI components of the practice will adopt a camera-centric approach, common in filmmaking, rather than being concerned with Cartesian space. Beyond this, visual effects methods such as matchmoving will be employed to combine footage and CGI, to create the illusion of a continuous camera movement for example. While these illusionary approaches could be considered at odds with the accuracy and verifiability required of survey and modelling for the generation of new archaeological knowledge, the outcome exists only in the context of filmic language, not scientific analysis. Just as the fieldwork is an attempt to respond creatively to the experiences of the site using photography and filming, so the lab work aims to visually communicate feeling by using moving image, rather than simply to create a virtual model of the site. Chapter three explored the capacity for digital media to go beyond the plastic appearance of the real and to deal with sensational and emotional realities. It is hoped that approaching CGI as a creative medium will allow for the representation of these experiential dimensions.

While the main case study uses these filmic approaches more exclusively, the supporting case studies will demonstrate where accurate three-dimensional recording and cinematic language can overlap. Here photogrammetric datasets which were collected with accuracy and coverage in mind are used in the production of animated outcomes as well as measurable orthographic views. These methods for three-dimensional data gathering are well established in archaeological practice (Remondino et al., 2011; Verhoeven et al., 2012; Green et al., 2014). The ways in which such models can be manipulated and augmented with other imagery - to add temporal, experiential and dramatic dimensions to the resulting visualisations - are more novel.

5.2.3 Evaluation

Written evaluation of the practice-research is problematic because of the subjective and experiential concerns of the research questions and visual outcome. As such, the visual artefacts of the practice will remain the key outcome of the research, supported by the theoretical and philosophical arguments represented in the written component of the thesis. In addition, audience feedback will be combined with the written and visual components to provide a "triangulation" of different perspectives (Gray and Malins, 2004: 143). For the main case study a questionnaire was designed to interrogate some of the assumptions of the research practice. This study should involve participants with a variety of levels of interest in visualisation technology and cultural heritage. Collecting meaningful and unbiased feedback on the visual outcomes will be difficult with a lack of equivalents for comparison of each aspect being explored. It would be hard to distinguish between whether the appeal of a piece lies in its technological means of production, or an emotive sense of landscape, for example. To mitigate for this the questionnaire will focus on images surrounding the research outcome, and compare reported feedback on specific aspects of the film as well as gauging its overall success. This study is based in practice rather than social science, and audience voice should only support the existing arguments made in the practical and theoretical outcomes.

5.3.4 Aesthetic approach

The visual outcomes for the case studies are a product of the research-practitioner's influences, experiences and intentions. While this context has been introduced in the proceeding chapters, it will be useful to outline the aesthetic approach that will be taken forward from theory into practice. This approach may be defined as an attempt to resolve an insider's view, or dwelling perspective, of landscape with the feelings and experiences of flight, tied as they are to conflicting notions of freedom, privilege, and the outsider's view. Decisions around lighting, framing, sound and pacing will be made to support a response to these concerns on an aesthetic level. Central to this aesthetic will be the use of the moving camera and the oblique aerial view.

In his 1937 article John Piper compares a vertical air photograph of White Sheet hillfort with an earlier hand-drawn plan. He points out that where the draughtsman has emphasised the "formidable [hill] that had to be toiled up and scrambled down whenever one wanted to visit the camp … [t]o the camera from the air, the hill is not much of a hill" (1937: 7). In other words these flattening vertical aerial photographs, favoured at the time by aerial archaeologists Crawford and Keiller, give little impression of the topography that dominated the experience of visiting the place.

In this regard the oblique aerial view, while technically problematic for mapping Cartesian space, can give a better impression of what a landscape is *like*. Historical examples of this difference, and the ways in which the vertical and the oblique have supported each other within instrumental images, have been given throughout chapter one. We can also say that, unlike the oblique, the vertical aerial view marks a departure from the traditions of linear perspective which tended to arrange objects receding towards a horizon. (This distinction, and its parallels with the shift away from traditional representation in the Modern art movements of his time, were the focus of John Piper's article.) The photography and animated sequences developed throughout the practice are dominated by the oblique view, not in order to align them to the traditions of linear perspective, but because looking towards a horizon is how we usually perceive landscapes from ground level. The intention behind the practical outcomes is to visualise landscapes in a way that can be related to the audience's own grounded experience. Where the vertical is used, it is understood that such a view presents a stark interruption to more relatable ways of seeing.

Throughout the animated sequences the camera is constantly in motion. This is in order to afford a better sense of three-dimensional space, through parallax, and also to suggest to the audience a sensation of flight and free agency above the landscape (as described in section 3.3). The animated sequences are slow-paced overall, offering lingering views of the landscape. The intention here is that the movement and editing does not demand the audience's attention but rather allows time to dwell upon the landscape. Where a soundtrack is added it serves to reinforce the meditative mood of this style and pacing. It is beyond the scope of this research-practice to explore the role of audio cues and soundscape in shaping perceptions of landscape heritage. Instead sound is used to complement and support the visual stimuli, which is where the research is focussed.

Lastly, the consideration of lighting, and the varied conditions that come from photographing at different times of day and year, will have a major impact on the resulting aesthetic. In chapter two (section 2.3) artist-photographers were discussed who have made careful use of lighting conditions in order to show up subtle topographic features (as is done in aerial archaeology), but also to give an impression of a transient moment of time within an ever-changing landscape. This is particularly important within this research-practice where the intention is to portray a landscape of active agency, rather than a fixed and static topography.

5.3 Summary

This thesis is concerned with creative practice, and its ability to mediate between visualisation technologies and lived experience. In order to answer research questions on the nature of practice and experience it is not enough to argue the hypothesis in text, which operates on a general, conceptual level (Cazeauz, 2006). Instead, the author will adopt the role of research-practitioner and immerse in the specific, hands-on experiences of archaeological visualisation both in the field and in the computer lab. This practice will explore first-hand the effects of the aerial view discussed in theory and examples throughout chapters one and two. Aerial photography by various means will be explored in the context of archaeological sites and landscapes experienced by the practitioner. The aim will be to demonstrate the potential for creative practice to connect such technologically produced images to the dimensions of landscape that are felt through lived experience. The technical accomplishment of the visual outcomes is not the focus here, but rather how successfully these visualisations communicate information about - and feeling of - landscape heritage, within the context of visual culture. The written component of the thesis aims to locate this practice within its cultural context and theoretical framework.

Any relevant contribution to this area must acknowledge the Postmodern aspirations of contemporary landscape archaeology, as well as the issues that embracing the specifics of personal and subjective experience might bring to any claim to new knowledge. Adopting a Postmodern research framework requires an acknowledgement of the researcher as a conditioning and constructive influence on the knowledge being researched (Holliday, 2007: 19). The visual outcomes operate within the domain of visual culture and as such remain specific to the cultural context within which they are produced and exhibited. While significant effort has been made throughout the previous chapters to understand the context of viewing of aerial and digital images - their influences and associations - it should be recognised that these meanings are not fixed, but are formed by the observer. Bearing in mind the necessity for this subjectivity, how then to ensure a contribution that is accessible and applicable elsewhere? Cazeauz maintains that theory and practice can support each other to such an end. Combining research-practice with a descriptive and contextual theoretical underpinning can, he argues, provide a “vivid and tangible impact on the form and identity of the work” (2006: 49). Rust agrees that tacit knowledge - such as that accessed by creative practice - can provide valid contributions even while they remain “unstated” (2007: 75). At best, by demonstrating a potential for new avenues of interdisciplinary practice, the visual outcomes of this research should provide what Rust describes as a “generative [...] point of departure for others” (2007: 75). This will be achieved by forming a

theoretical argument for the role of creative practice in heritage visualisation, in conjunction with explorations and demonstrations of this how this theory is applied in practice. Using this methodology the research questions will be tackled within the main case study project, *The Caterthuns*, and in supporting case studies where additional sub-questions will be explored.

Chapter 6 - Main case study: The Caterthuns

6.1 Introduction

The central research question of this thesis asks whether creative practice can bridge the gap between lived experience and the visualisation of landscape heritage, specifically in the area of aerial photography and digital media. This main case study aims to answer that question with the production of a short film which responds creatively to the archaeological site of the Caterthuns, located in Angus, Scotland. The site consists of two substantial Iron Age hillforts on adjacent hills on the periphery of the Grampian Mountains. This site was chosen for the main case study for two key reasons. Firstly it consists of a variety of remains and earthworks, the extent of which is difficult to grasp from ground level, and as such lends itself to visualisation from the air. Secondly its emotive landscape setting is critical to the experience and to the archaeological interpretations of the site. Some of the earthworks are near-impossible to distinguish from ground level and were only identified from the air (Dunwell and Strachan, 2007: 15). At the same time the significance of the Caterthuns as a monument and place within the landscape is best understood by ascending the hilltops on foot. As such the site poses a challenge for public interpretation. Vertical aerial photographs, topographical survey and site plans show the form and extent of the archaeological remains but reveal little of the character of the site, nor the aesthetic impact that visiting such a place can have. This project set out to bridge the gap between these two ways of understanding the Caterthuns.

To achieve this, creative practice was used not only because of the range of outcomes that it could provide, but also because it afforded a platform for engagement with the landscape that was suitable to the experiential concerns of the project. Aerial photography - using a variety of methods and altitudes - was gathered specifically for the production of a short film outcome, which was constructed digitally using methods from visual effects and computer generated imagery (CGI). These methods have some overlap with those used in archaeological survey, notably aerial photography and photogrammetry, but were undertaken without the constraints of such outcomes in mind. Fieldwork was carried out between the Autumn of 2012 and the Spring of 2014 with the majority of photography and filming taking place during the winter months when the sunlight, vegetation, and occasional snowfall, contributed to favourable conditions for photography. Such aesthetically-led considerations defined the approach of the project. Rather than attempting to capture a single digital model of the site from which to render the animated shots - a workflow

that would allow more flexibility during the end stages - the outcome was instead closely based upon photography composed on-site. This meant that the initial photography was paramount. The intention here was twofold. Firstly the film outcome should remain as close as possible to the real-world site, rather than the digital model, particularly in its subtle transformations during different times of day and year. It was also important to allow the resulting images to respond to the photographer's experience. Multiple visits to the Caterthuns, both from the air and on foot, allowed the research-practitioner to build a deep impression of the site as experienced in different conditions. Some images were carefully planned in advance while others were the product of serendipity and composed in-situ. All of the photography and filming is in part a reflection of the Caterthuns as experienced by the research-practitioner.

6.2 The site

The Caterthuns consist of two adjacent Iron Age hillforts, known as Brown Caterthun and White Caterthun. The two hillforts differ in their construction but both cover a large area of their respective hilltops. White Caterthun is the most distinctive with a large ruined stone wall and deep ditch surrounding the inner enclosure. While this, the most visible feature, is around 200 x 120 metres in size, the outermost ditch and enclosure is much larger spanning some 400 x 240 metres. The outer enclosures survive only as an earthwork and can be difficult to identify from the ground. While there is no stone wall at Brown Caterthun there is a more elaborate series of concentric ramparts and ditches extending more than 300 metres in diameter. The two hillforts are positioned around one kilometre apart. Their large scale and the ruinous condition of the ditches and ramparts means that both hillforts have a much greater visual impact when seen from above (figure 6.1, figure 6.2).

Figure 6.1 - White Caterthun with Brown Caterthun behind. Oblique aerial photograph taken from light aircraft by the research-practitioner, 2013.

Figure 6.2 - Brown Caterthun with White Caterthun behind. Oblique aerial photograph taken from light aircraft by the research-practitioner, 2013.

The Caterthuns are outlying foothills of the Grampian Mountains and lie on the Highland Boundary Fault - a geological fault line that roughly divides the Scottish Highlands and Lowlands - around five kilometres west of the village of Edzell in Angus, Scotland (figure 6.3). Their location affords a view towards the upland Angus Glens to the north-west, and across a wide strip of low arable land towards the North Sea to the south-east. From the summit of White Caterthun it is possible to see East Lomond hill in Fife, another Iron Age hillfort site, located some 70 kilometres to the south.

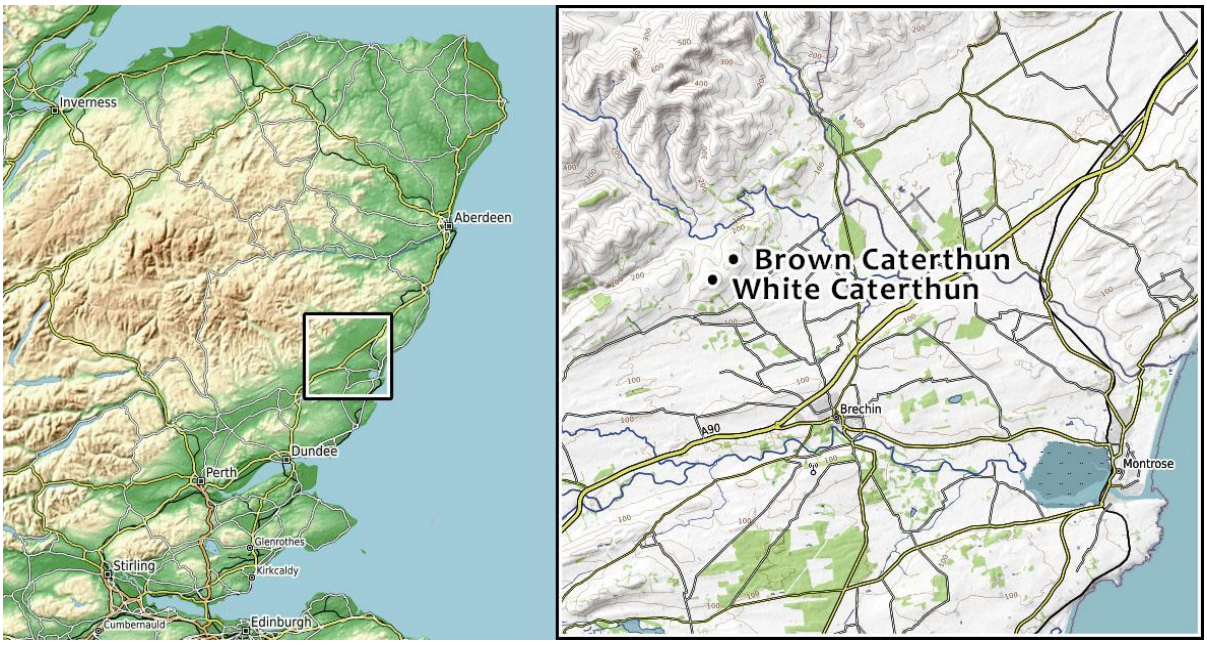


Figure 6.3 - The location of White and Brown Caterthun. Map data © OpenStreetMap contributors and SRTM, map style © OpenTopoMap (CC-BY-SA).

The Caterthuns have long been a significant landmark of the local area. White Caterthun was depicted in plan and profile as an engraving in Thomas Pennant's 1772 publication *A Tour in Scotland* (figure 6.4). The engraving includes a view of White Caterthun observed from the vantage point of Brown Caterthun, although the second hillfort itself has not been recorded. Another profile made from a vantage point towards the town of Brechin has been used to project proportions onto the plan view. Despite a lack of measured survey the engraving is remarkable for its closely attuned observations which include an outer annex and a rectangular (probably modern) inner enclosure. The Caterthuns (then spelled "Catter-Thuns") were later mapped in William Roy's 1793 *The Military Antiquities of the Romans in Britain* (although the site is now known to belong to the pre-Roman era). Since then the site has been surveyed in more detail by

Ordnance Survey. The first detailed archaeological survey and interpretation was undertaken by the Royal Commision on the Ancient and Historical Monuments of Scotland (RCAHMS) in 1989. The site plans produced during the 1989 survey remain the most detailed of the hillforts (see appendix C: example B), and mark the traces of subtle features such as unfinished ramparts, hut platforms, and possible palisade enclosures. The only archaeological excavations at the Caterthuns took place between 1995 and 1997. These were carried out by Historic Scotland and directed by Andrew Dunwell and Richard Strachan. More than 20 trenches were excavated at Brown Caterthun, which was under threat from erosion and rabbit damage, with an additional four trenches dug at White Caterthun. Radiocarbon dating of samples taken from Brown Caterthun confirmed the Early Iron Age origin for the site (dating from around the Fifth Century BCE). Although no radiocarbon dates were acquired for White Caterthun, Dunwell and Strachan stressed the underlying similarities in the construction of White and Brown Caterthun and suggested that they should be considered effectively two components of the same site (2007: 91).

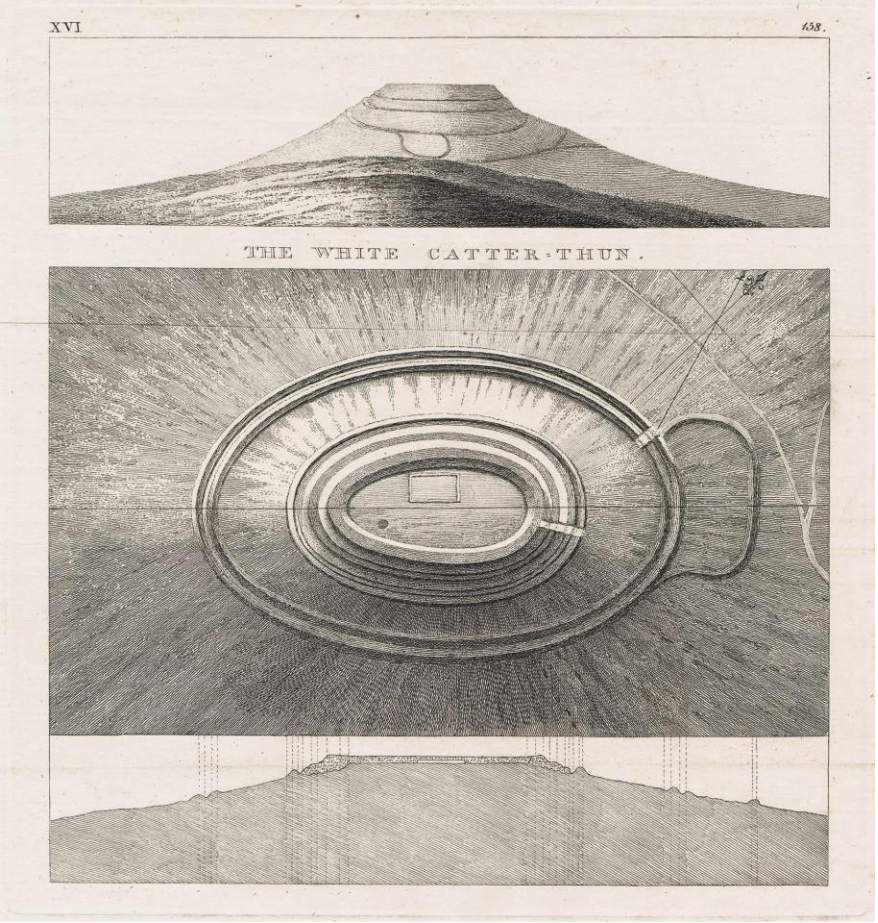


Figure 6.4 - “The White Catter-Thun”, engraving from *A Tour in Scotland*, Thomas Pennant, 1772. Public domain image.

Despite these extensive archaeological investigations, the purpose and use of the Caterthuns remain uncertain. Little evidence of the activities that took place at the site was uncovered by the excavations. Considering the arrangement of enclosures at Brown Caterthun in particular - which have multiple entranceways leading to the centre - it is considered that the boundaries could have more of a symbolic value, rather than marking an enclosed hilltop settlement (Dunwell and Strachan, 2007: 91-92). As such the meaning of both hillforts has been re-framed in line with a broader reconsideration of Iron Age sites, which foregrounds the potential for them to act as ritual sites that held communal and social, rather than necessarily practical, significance. Supporting this interpretation, many Iron Age sites are associated with artefacts - and in some cases architectural components - that predate their construction by thousands of years. The most visible example of this at the Caterthuns is a large cup-marked boulder which now lies amongst the rubble of the stone wall on the west side of White Caterthun (figure 6.5). While such carvings are difficult to date, cup-mark motifs are found widespread across Western Europe and are broadly associated with the Neolithic and Bronze Age. Many Iron Age sites in the area incorporate marked stones, which are likely to significantly predate the sites themselves. What is unusual about the boulder at White Caterthun is its size (approximately two metres long). This raises two possibilities: either that the stone was located on the hilltop before the construction of the Iron Age hillfort, or that it was moved there at significant effort. Both interpretations hint at a symbolic significance to the location of the Caterthuns, assuming this speculative chronology is correct. Regardless, the placement of the large cup-marked stone encourages the visitor to reconsider the time scale, function and importance of the site in prehistory.

Figure 6.5 - Cup-marked stone at White Caterthun. Photograph by the research-practitioner, 2012.

Today the site is part of the Balnamoon Estate, and as such heather burning and grouse shooting regularly take place around the site. It is also a popular location for walkers. There is a road and parking area located between the two hillforts and well defined paths to both summits. White Caterthun in particular is a favoured walking route, affording panoramic views of the surrounding landscape. Historic Environment Scotland cares for the site, which is a scheduled monument, and maintains an interpretation panel adjacent to the parking area. The panel features a watercolour rendition of an imagined aerial view of the Caterthuns which combines the backdrop of the Grampian Mountains with plan views of the hillforts based upon the RCAHMS site plans (see appendix C: example A). The proportions of the landscape have been distorted to give a clearer view of the archaeological features, which are labeled. The panel also contains information on the fort and the excavations that took place in the mid 1990s.

6.3 The research-practice

The research-practice involved the creation of a short film using methods of aerial photography and CGI that had previously been explored by the research-practitioner (Baxter, 2014). These involved some methods commonly used in archaeological survey (aerial photography and photogrammetry) and some more often used in visual effect and animation (multi-pass rendering and compositing). These methods were adapted further for this case study, with the inclusion of

live action footage and matchmoving for example. From a technical perspective there is nothing novel about these methods which have been borrowed from the fields of photography, survey, animation and visual effects. The contribution that this project aims to make is to suggest how these established methods can be applied creatively, in an interdisciplinary context, to improve the visualisation of archaeological landscapes for a public audience. One of the ways this will be achieved is by adopting an approach that focuses on photography as a creative practice of observation and engagement with the site. While there is some overlap with the hardware and software used in survey, the approach here is very different. Instead of aiming for complete three-dimensional coverage of the site, aerial photography and photogrammetry were orientated around photographic concerns of composition, lighting and atmospheric conditions. The Caterthuns are part of a multifaceted and dynamic cultural landscape. In order to respond to this, fieldwork was conducted using a variety of tools and perspectives.

6.3.1 Fieldwork

Collection of photography and footage at the Caterthuns by various means began in November 2012 with permissions from both Balnamoon Estate, who own the land, and Historic Environment Scotland (then Historic Scotland), who care for the scheduled monument. Fieldwork was part financed by a contribution from the Historic Scotland Sponsorship Fund which helped pay for light aircraft charter and travel expenses to and from the site. The fieldwork was completely weather-dependant as particular conditions, such as low evening and morning sunlight, were needed. In addition, wind speeds had to be within an acceptable range for all of the methods used, and in particular with unmanned aerial vehicle (UAV) and kite aerial photography. The location of the site made this aspect of the fieldwork challenging, as the Grampian Mountains are located upwind of the prevailing wind direction. This creates turbulence and unpredictable gusts in the lee of the mountains, further narrowing the weather window where low altitude photography could be gathered.

Photography under snow cover was collected whenever possible. As well as giving an impression of the dynamic - and challenging - nature of the landscape, patches of snow accentuate the topography of the site, adding to the clarity of the aerial visualisation. During kite aerial photography in February 2013 it was noticed that drifted snow had made visible one of the subtle circular enclosures in the centre of White Caterthun. This feature, which is almost impossible to identify from ground level, is described by Dunwell and Strachan as a “possibly palisaded” enclosure of unknown date (2007: 77). The resulting vertical kite aerial photography of the feature

(figure 6.6) was used in the final animated sequence. This is a notable example of how the naturally occurring conditions commonly used by aerial archaeologists to visualise features (see Riley, 1987: 11-40) can be used for dramatic effect as well as clarity. Where some images were carefully planned ahead of time, this is also an example of imagery made as a result of serendipity and reflexive decisions made on-site.

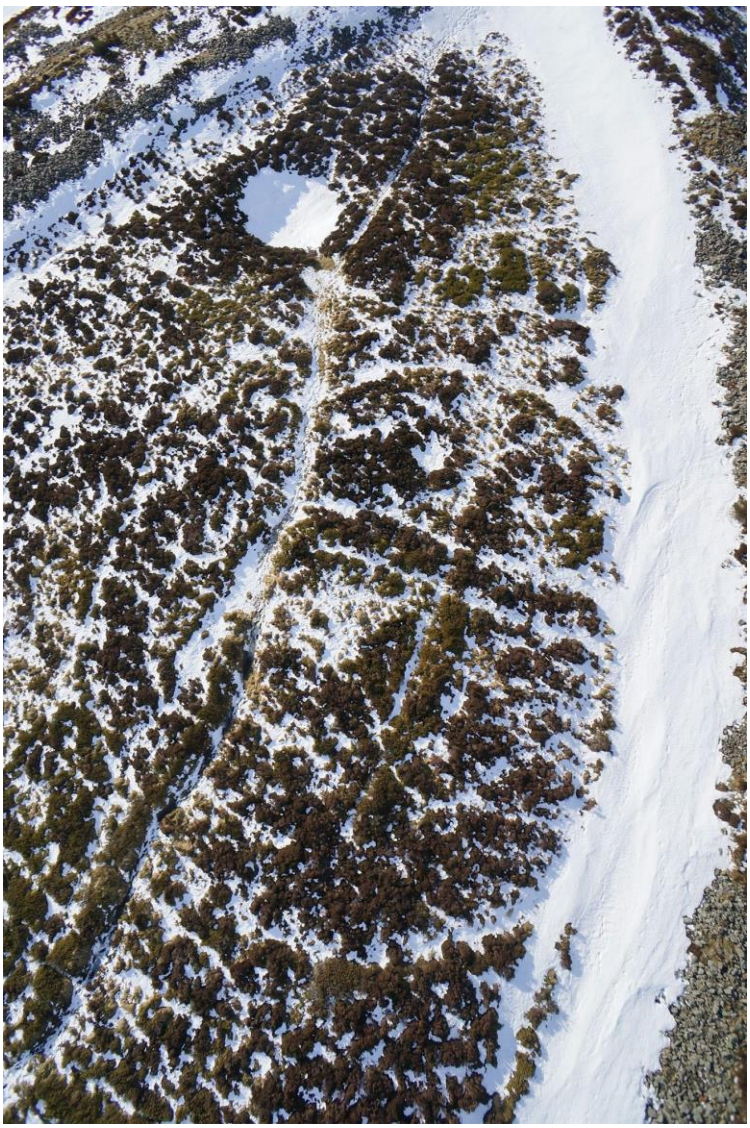


Figure 6.6 - Snow reveals a large circular enclosure, kite aerial photograph by the research-practitioner, 2013.

Still photography was used to gather imagery from the kite and light aircraft flights, rather than filmed footage. Sequences of photographs were later processed using photogrammetry to create animated camera movements. This was in part due to limitations of the aerial platforms in terms of stability and freedom of movement, but also allowed for sequences taken at different altitudes

and times of year to be combined together in ways that would be difficult to achieve otherwise. Kite aerial photographs were taken to provide areas of detailed photogrammetric coverage that would be later used in a CGI environment for low level (below 60 metres altitude) animated shots (figure 6.7). This approach was quite different from the standard methods for modelling sites using low altitude aerial photogrammetry (see Verhoeven et al., 2012; Remondino et al., 2011), because it was orientated around specific photographic/cinematic compositions rather than complete coverage. Where oblique shots were used which included the horizon, the virtual scenes were arranged into foreground, middle distance and background. Depending on the intended camera movement, parallax determined different requirements for the level of detail in each region. This allowed flexibility to include shots in different lighting/weather conditions, from different perspectives, and including the landscape context. A single photogrammetric model of the hillforts would not have allowed this flexibility and diversity in the film outcome. In short, this methodology was orientated around the demands of photography as a creative practice with a film outcome, not a measured survey, in mind.

Live action filming was used in the case of the UAV footage (used for mid-level altitudes below 120 metres) and filming at ground level from a tripod/boom. The aim of the ground level filming was to give a close-up impression of the experience of walking to the summit of White Caterthun and exploring the features that are visible from the ground. These shots focussed on close-up views of stone features and include a figure to provide scale and human presence particularly in the context of the aerial components. The footage was later manipulated and combined with photogrammetric models in order to link the close-up views to the aerial view both spatially and thematically. In addition to close-up filming and photogrammetry, a tracking dolly and jib (boom) were used to film a camera movement which ascends from ground level to a height of around two metres (figure 6.8). This shot was later spliced into higher altitude imagery to create a continuous camera movement from ground level to high altitude. Filming the low level components allowed for the inclusion of the figure approaching the cup-marked stone. Weather conditions that matched that of the aerial imagery were critical for this filming, which was undertaken with assistance from Kieran Duncan, Nuria Valdeon and Michael Webster, and with permission from Balnamoon Estate and Historic Environment Scotland.

Figure 6.7 - Collecting kite aerial photography at White Caterthun. Photograph taken from the kite line, 2012.

Figure 6.8 - Filming at the cup marked stone using a tracking dolly and jib. Photograph by Kieran Duncan, 2013.

High altitude (above 150 metres) imagery was taken from a Cessna 172 light aircraft. This high-wing aircraft has the advantages of relatively low operational cost - compared to rotary wing helicopters for example - good maneuverability and adequate viewing angles for photography (figure 6.9). Its high speed (between 80 and 120 mph), vibrations and obstructions to the angles of viewing - including the wing, strut and wheel - make it less ideal for live action filming however. Instead, high resolution stills were collected in a manner similar to the kite aerial photography with movement added later in a CGI environment. In total, three light aircraft flights were undertaken in March 2013, November 2013 and April 2014. At the time of the first flight there was snow cover at the site. The other two flights provided imagery under both morning and evening lighting conditions, which was used at different points in the film outcome. During each flight a number of orbits of each hillfort allowed for a range of photographic opportunities. While the flight path was pre-planned to some extent, adjustments were made in response to the conditions on the day and compositional considerations made in flight.

The majority of the aerial components were based on high altitude photography, with low level kite aerial photography used as a basis for CGI reconstructions and to link in with the ground level filming. UAV filming was used for a mid-level shot showing the detail of the multiple enclosures at Brown Caterthun. This was undertaken in collaboration with drone pilot Martin Groves, with a DJI Inspire 1 UAV (figure 6.10). The UAV carries a gimbal-stabilised camera capable of shooting high resolution footage. Two controllers and monitors were used, one operated by the pilot to control the path of the UAV and one operated by the photographer to compose the shot. The level of control and precision that this provided meant that the shot resembled the digitally animated sequences that it accompanies in the film outcome.

By using a diverse range of methods for photography and filming during the fieldwork - close-up, boom, kite, UAV and light aircraft - the intention was to allow as much creative freedom as possible, in particular with regard to the movement and placement of the camera and the photographic composition of the shots. In addition, through multiple visits to the site under different conditions and circumstances it is hoped that the research-practitioner could respond photographically to their own experience of the place, from something closer to what Ingold termed the “dwelling perspective” (1993: 59).

Figure 6.9 - The research-practitioner photographing from a Cessna 172. Photograph by Dr Alice Watterson, 2015.

Figure 6.10 - Martin Groves flying a DJI Inspire 1 UAV at White Caterthun, photograph by the research-practitioner, 2015.

6.3.2 Lab work

The computer lab based development of the film outcome was driven by the fieldwork as far as possible. One aim of the project was to use the experiential aspects of the site as a platform to communicate the archaeological narratives, and as such it was important that the computer-generated components of the film were informed by time spent at the site. In practical terms this meant that while the CGI environment was used to manipulate the camera movement, combine imagery together and add reconstructed elements, overall camera positions, composition and lighting remained very close to the original photographs. Each shot was predominantly designed and executed during fieldwork. Shots were then completed using a variety of visual effects and CGI methods.

Structure from motion (SFM) photogrammetry was a key method by which sequences of still photographs were converted into three-dimensional models, such that the camera could later be animated. While a number of photogrammetry software solutions are available, *Agisoft Photoscan* is the most widely used - due to its accessibility and versatility - and was adopted for this project. Sequences of multiple photographs taken from a moving platform - such as from a kite or light aircraft - are ideal for processing with *Photoscan* as they result in high image redundancy (the amount of overlapping photographs) and baseline distance (lateral movement between camera positions). Once a three-dimensional structure has been reconstructed, the images can be projected back onto the computer generated surface to give an appearance close to the original photographs. Further to this, colour texture from one sequence of photographs can be combined with three-dimensional structure from another, providing more flexibility. For some shots a relatively simple process was used to “pop-out” a series of photographs into three dimensions while in others multiple layers of sequences were combined together, to facilitate more ambitious camera movements or transitions between imagery taken at different times for example. *Autodesk Maya*, a CGI software solution commonly used in animation and visual effects, was used to bring together the different components and produce the animated outputs.

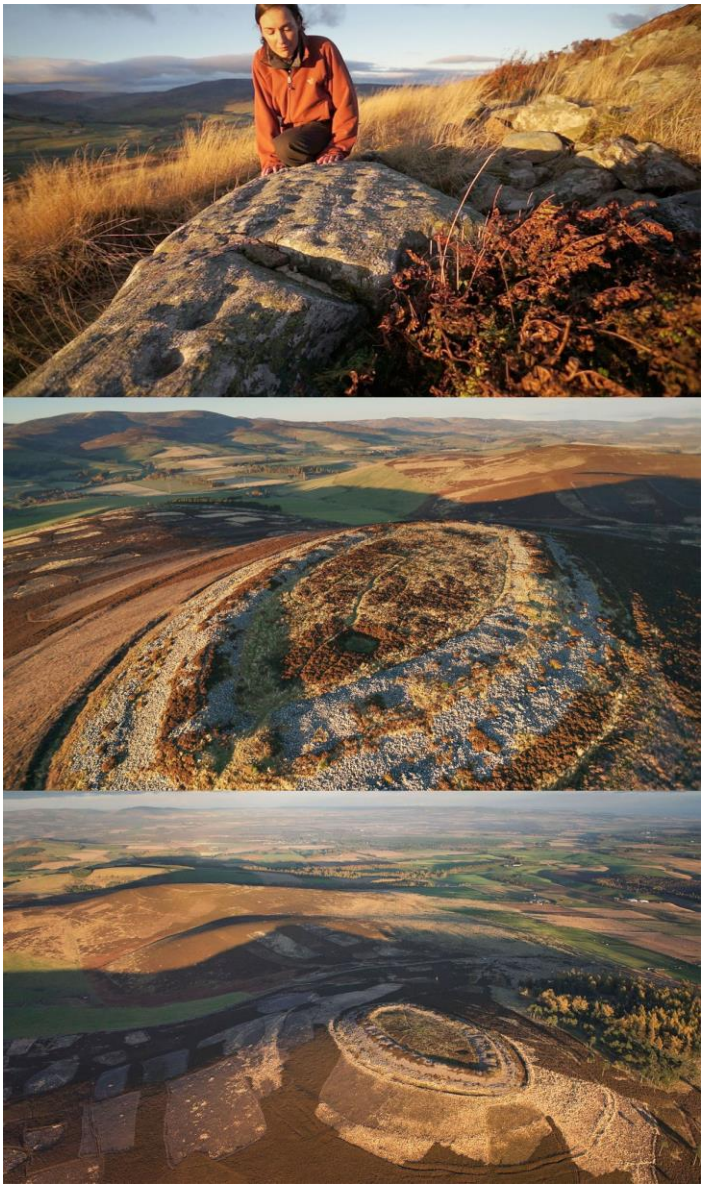


Figure 6.11 - Components of a visual effects sequence moving from ground level to high altitude, from “The Caterthuns” film.

In one such shot the camera was animated to ascend from a position less than a metre above the cup marked stone at White Caterthun to a position around 300 metres above the site in one continuous motion (figure 6.11). The beginning of this shot consists of footage filmed from the tracking dolly and jib (boom) which was seamlessly spliced into a CGI environment based on kite and light aircraft aerial photography, taken in matching lighting conditions. This was achieved first by reconstructing a three-dimensional model in such a way that there was increased level of detail where the camera “flies” close to the ground surface. The low level footage was then combined with the CGI elements using the visual effects method of “matchmoving” (or motion tracking).

Using this method the filmed footage is analysed in order to extract the three-dimensional movement of the physical camera boom, and this information is then used to carefully splice the filmed and synthesised components together into a single shot. While this shot took considerable time to execute, it is a key link in the narrative of the film outcome as it connects the relatable, grounded view with the distanced, high level perspectives which dominate the film.

Figure 6.12 - White Caterthun, oblique kite aerial photography by the research-practitioner, 2013.

Figure 6.13 - Digital reconstruction sketch of White Caterthun by the research-practitioner, 2014.

While the film outcome focuses on telling the archaeological narrative using the visible remains as they are experienced today, speculative reconstructed elements were also used to visualise the lost structures at White Caterthun. This reconstruction was undertaken in consultation with a number of archaeologists who have worked with Scottish hillforts, including those involved in the 1990s excavations at the Caterthuns, and was completed in collaboration with archaeologist and digital artist Dr Alice Watterson. To initiate these discussions a reconstruction sketch was created by the research-practitioner. Using a kite aerial photograph as a starting point (figure 6.12) a two-dimensional digital painting of the lost structures was derived from the details of the excavation report and from interpretations of other hillforts in the region (figure 6.13). This image was disseminated in order to collate expert opinions before implementation of the three-dimensional reconstruction model began.

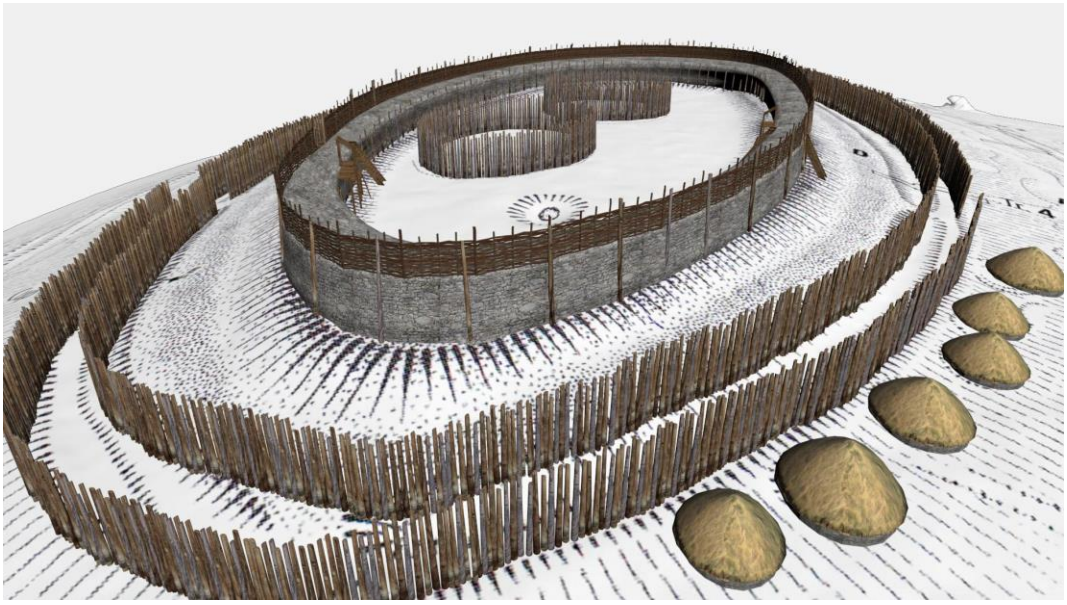


Figure 6.14 - Draft layout of the 3D interpretative reconstruction at White Caterthun by Dr Alice Watterson, 2014.

Dr Alice Watterson is an archaeologist and a specialist in interpretative reconstruction using CGI methodologies. Her expertise and experience of other Iron Age hillfort sites influenced the execution of the reconstruction model. The tumbled remains of the wall leave little indication as to the presence and nature of entranceways leading to the inner enclosure for example. The resulting interpretation draws from evidence of other excavated hillfort walls. Watterson's knowledge and approach in dealing with such areas of uncertainty, along with collective input from other archaeological experts, allowed the reconstruction to be archaeologically informed.

6.4 The film outcome

The outcome was edited into a short (3 minute 50 second) film which arranged the shots into a meaningful narrative. The film introduces the site starting with the close-up perspective showing a figure walking up the ramparts of White Caterthun and approaching the cup-marked stone. The visual effects composite shot is then used to connect the close-up to the high aerial view in one continuous camera motion. Low and high aerial shots are used to show some of the features of both White and Brown Caterthun in changing light and seasons. The final sequence shows the reconstruction of lost features at White Caterthun, completed in collaboration with Dr Alice Watterson. Text annotations, which are positioned in respect to the three-dimensional space of each shot, are used throughout the film to aid interpretation (figure 6.15). The wording was informed by the excavation report along with consultation from archaeological experts. The camera is constantly moving throughout the film in order to give an impression of three-dimensional space and the sensation of flight above the landscape. A soundtrack was selected to accompany the film - *Borderlands* by Tim Hecker - and reproduction rights were secured from the publisher. This track was chosen to support the meditative tone of the film.

Figure 6.15 - Still frames from “The Caterthuns” film outcome.

The Caterthuns was designed as a practice-based research outcome, to allow the research-practitioner to learn by doing, and to demonstrate the ability of creative practice to bridge the gap

between lived experience and the visualisation of heritage landscapes. At best it should implicitly suggest possibilities for new approaches to practice that are not routinely undertaken in heritage visualisation. The film was intended as a response to the research questions and poses practical solutions to the problems raised by the theoretical background. These include the disparities between the visualisation technologies of aerial photography and CGI and the lived experience that is so critical to our perceptions of landscape. In this regard, the film outcome should speak for itself. While the main contribution offered by this thesis remains practice-based, a consideration of audience response offers one way to evaluate the success of the outcome.

6.4.1 Audience response

The Caterthuns film was made publicly available on the online platform Vimeo in November 2015 and was met by a positive response from both heritage experts and non-experts. Comments were directed towards the technical and interpretive aspects of the film but also the representation of atmosphere and sense of place that was integral to the project design. The film received over 13 thousand views within the first twelve months of being online, most of which traffic was related to the AHRC *Research in Film Awards* and associated media coverage. While such figures are inconsequential in the context of online content sharing, they speak for the ability of film to bring academically driven outcomes to a wide public audience. The film outcome won the doctoral category of the 2016 *AHRC Research in Film Awards*. *The Caterthuns* was selected from a shortlist of five films produced by AHRC sponsored PhD students at an awards event in London (figure 6.16). The judges reported that “The film was of a high standard technically” and told a story that is “informative and emotional” (quoted in the awards programme). This award success generated interest in the film and resulted in the project featuring in the local press, online and on the BBC World Service radio programme *Click* (broadcast on 15th November 2016). While it is encouraging to see that practice-based research outcomes can have visible impact on a broad audience, closer consideration of audience response attempted to assess the extent to which the film had responded to the research questions.

Figure 6.16 - The author (right) and collaborator Dr Alice Watterson (centre) receiving the 2016 *AHRC Research in Film Doctoral Award* presented by Jan Dalley (left), November 2016.

6.4.2 Survey: Visualising the Caterthuns

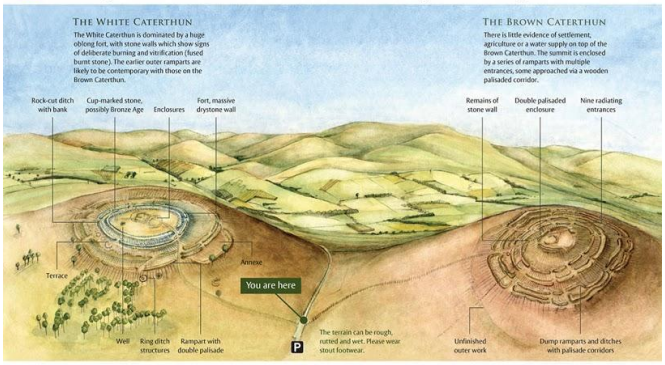
A questionnaire survey was designed (appendix B) to evaluate *The Caterthuns* film outcome in terms of the research questions and in the context of other images that have been used to visualise and interpret the site. Gathering meaningful and unbiased feedback on the film is problematic because it is so clearly associated with the researcher. To mitigate for this the survey would first focus on five examples of still images that visualise the site using the aerial view. The second part of the survey asks participants to compare the moving film to the still example images. Such a comparison is difficult to assess both because of the issue of attribution and because the film outcome is radically different in medium and content compared to the still images. It is the comparison between the different images, and between the different criteria against which participants were asked to score the examples that is of most interest. The five example images were selected from previous visualisations of the site (figure 6.17; appendix C). In each case, appropriate permissions were granted to use the image in the study.

Example A is an extract from the interpretation panel installed on-site adjacent to the parking area and maintained by Historic Environment Scotland. It is a coloured watercolour version of a drawing showing an imagined aerial view of both White and Brown Caterthun and the Grampian hills behind. The archaeological features are marked based upon the RCAHMS site plans, and

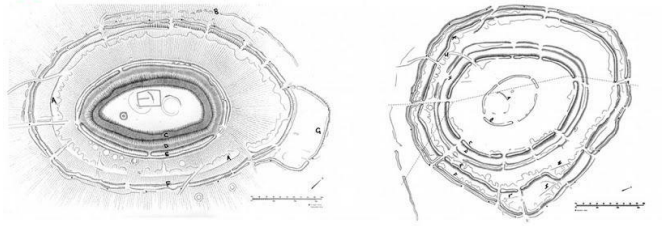
labelled with text annotations. In theory the image represents an oblique aerial view, although the landscape has been distorted to better show the archaeological features. It is likely that the image is derived from a combination of ground-based observation of the background and the site plans only, rather than of an actual aerial view. There is little attempt to accurately represent the topography of the Caterthun hills themselves, or the landscape of the middle distance. There is also limited representation of lighting and weather, with clear blue sky filling the upper half of the image. Despite these shortcomings the image functions as a pictorial cartography of the site, which helps to orientate the visitor and make them aware of the archaeological features.

Examples B, C and D are all orthographic (including no foreshortening) vertical projections of the site. Example B consists of the site plans made by RCAHMS in 1989. They contain all of the known archaeological features of both hillforts drawn out in a standard format. These drawings contain a lot of detail but are coded in a way particular to archaeological site plans. They contain little representation of the topography aside from an indication of the direction of the slope around White Caterthun. Example C is an orthophoto (an orthographically rectified photographic montage) of the site sourced from the aerial survey company *Getmapping*. This image is derived from high altitude vertical aerial photography taken as part of a large area survey. This imagery is measurable, like a map, and was also used within the mapping interface *Google Earth* untill 2011. Like a photograph it shows true colour, and oblique lighting in the image reveals a little of the topography, especially at White Caterthun. Example D is an orthographic rendering of elevation maps of each hillfort supplied by researcher Susie Green, from University College London, in collaboration with the research-practitioner. Aerial photographs, taken during the first light aircraft flight in March 2013, were processed using SFM photogrammetry to create a digital elevation model and rendered in such a way as to visualise the topographical details clearly. Green specialises in aerial applications of SFM photogrammetry that allow subtle archaeological features to be detected and interpreted (Green et al. 2014). This image shows elevation *deviation* maps meaning that large scale variations in the site's topography have been ignored in order to accentuate smaller features such as the earthworks and hut platforms. The maps contain a lot of uninterpreted information that might be difficult for a non-expert to read in a meaningful way.

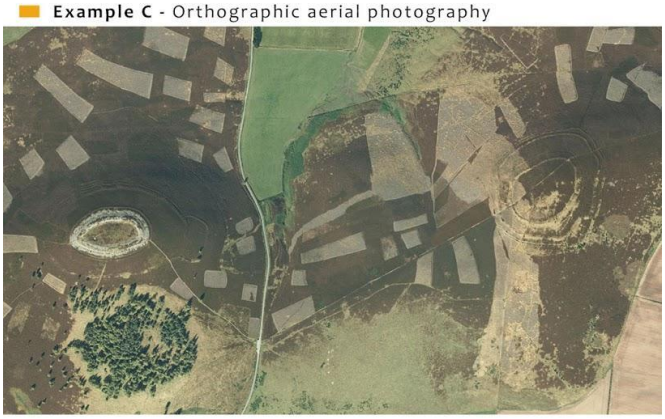
Example A - Extract from on-site interpretation panel



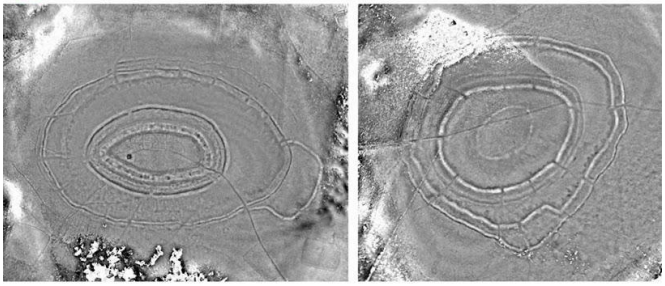
Example B - Archaeological site plans



Example C - Orthographic aerial photography



Example D - Elevation deviation maps



Example E - Oblique aerial photographs

Figure 6.17 - The five example images used in the questionnaire. For larger versions see appendix C.

Example E consists of two oblique aerial photographs taken by the research-practitioner from a light aircraft in November 2013. One shows White Caterthun in the foreground with Brown Caterthun and the surrounding landscape - including the horizon and sky - in the background. The other is a similar view with Brown Caterthun in the foreground, which stops just short of the horizon. This image has a hazy appearance, in part due to nearby heather burning at the time when the photograph was taken. Both images are taken under oblique evening light shortly before sunset. While neither image shows the archaeological features in as much detail as the other examples, the oblique view and long shadows place the site in the context of its topography and the surrounding landscape. These oblique aerial photographs relate to the imagery used in *The Caterthuns* film in that they incorporate lighting and atmosphere and attempt to show the site within the context of the broader landscape. This is in contrast to the orthophoto which offers a more cartographic representation. To interrogate these different aspects of the images, participants were asked the extent to which each example successfully:

- gives a sense of the archaeological features of the site
- gives a sense of how the site relates to the surrounding landscape
- gives a sense of the three dimensional space of the site
- gives a sense of the mood and atmosphere which might be felt at the site
- is likely to encourage you to visit / return to the site

It was first considered that participants should score each example and criterion combination separately - with marks out of ten for example - but ultimately a different system was adopted where the examples were placed in order of preference. This was designed to encourage the participants to compare the image examples with each other according to each criterion, rather than considering them independently. Ratings of *least* to *most* successful were later converted into scores of 0 to 4, meaning that each question/criterion has a fixed number of 10 points available, which are distributed across the examples according to the participant's preference. This model does not allow the participant to express if one criterion is stronger or weaker overall. Instead the strengths and weaknesses of each example can be easily compared across the different criteria (figure 6.19).

In the final part of the questionnaire participants were also asked whether they felt that *The Caterthuns* film added to each of the same criteria, when compared to the still images as a whole. Unsurprisingly participants tended to agree that the film did add to each criterion, although this

could be affected by the medium rather than the content, or a clearer attribution of the researcher as author of the work. The following analysis will focus instead on the variations between feedback on the different criteria and image examples.

Two groups of participants were used. Group 1 consisted of ten students enrolled in the MSc Animation & VFX course at Duncan of Jordanstone College of Art and Design, University of Dundee. This group were expected to have a high level of interest in digital media but not necessarily in heritage and archaeology. The group consisted of a diverse range of ages (younger overall than group 2) and nationalities. The questionnaire was conducted in an informal focus group type setting in November 2016. Group 2 consisted of nine Blue Badge Guides who participated during a meeting convened by the British Guild of Tourist Guides at McManus Galleries, Dundee. This group of certified tourist guides were expected to have a high level of interest in heritage and archaeology but not necessarily in digital media. Before being asked to consider the example images the questionnaire prompted the participants to rate their existing familiarity with the site of the Caterthuns in terms of both the location and the archaeological interpretation. Both groups reported little prior familiarity with the site, with group 1 being less familiar as expected (figure 6.18).

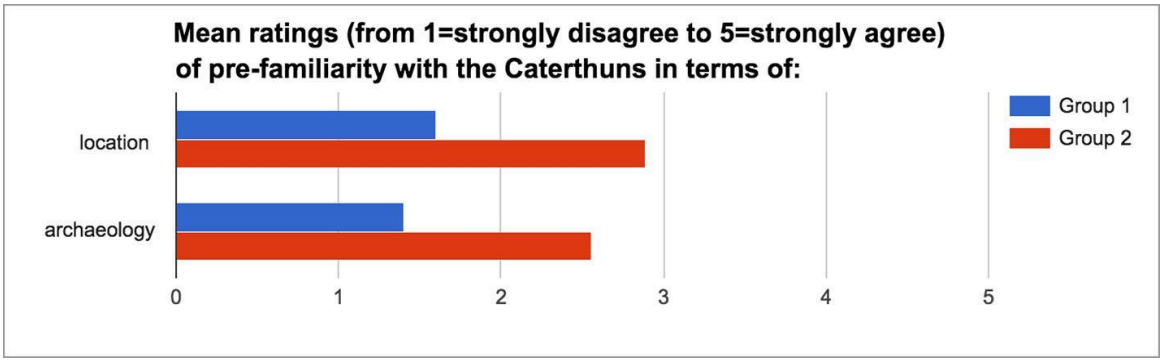


Figure 6.18 - Mean reported ratings of existing familiarity from each group.

Figure 6.19 shows the distribution of preference in the example images against each of the criteria, here abbreviated to: *archaeology*, *landscape*, *3D*, *mood/atmosphere*, and *inspiration to visit*. Of particular interest are the image currently displayed on the on-site interpretation panel (Example A shown in blue) and the oblique aerial photographs (Example E shown in purple). The orthographic images (examples B, C and D) are shown in red, yellow and green. Grouped in this way it is immediately evident that the orthographic images scored poorly compared to the oblique aerial views. The highest scoring of the orthographic images was the true colour orthophoto

(example C) used in *Google Earth*. Examples B and D, which contain the most detailed information about the archaeology when decoded by specialists, but reveal little of the topography or landscape, scored the lowest overall.

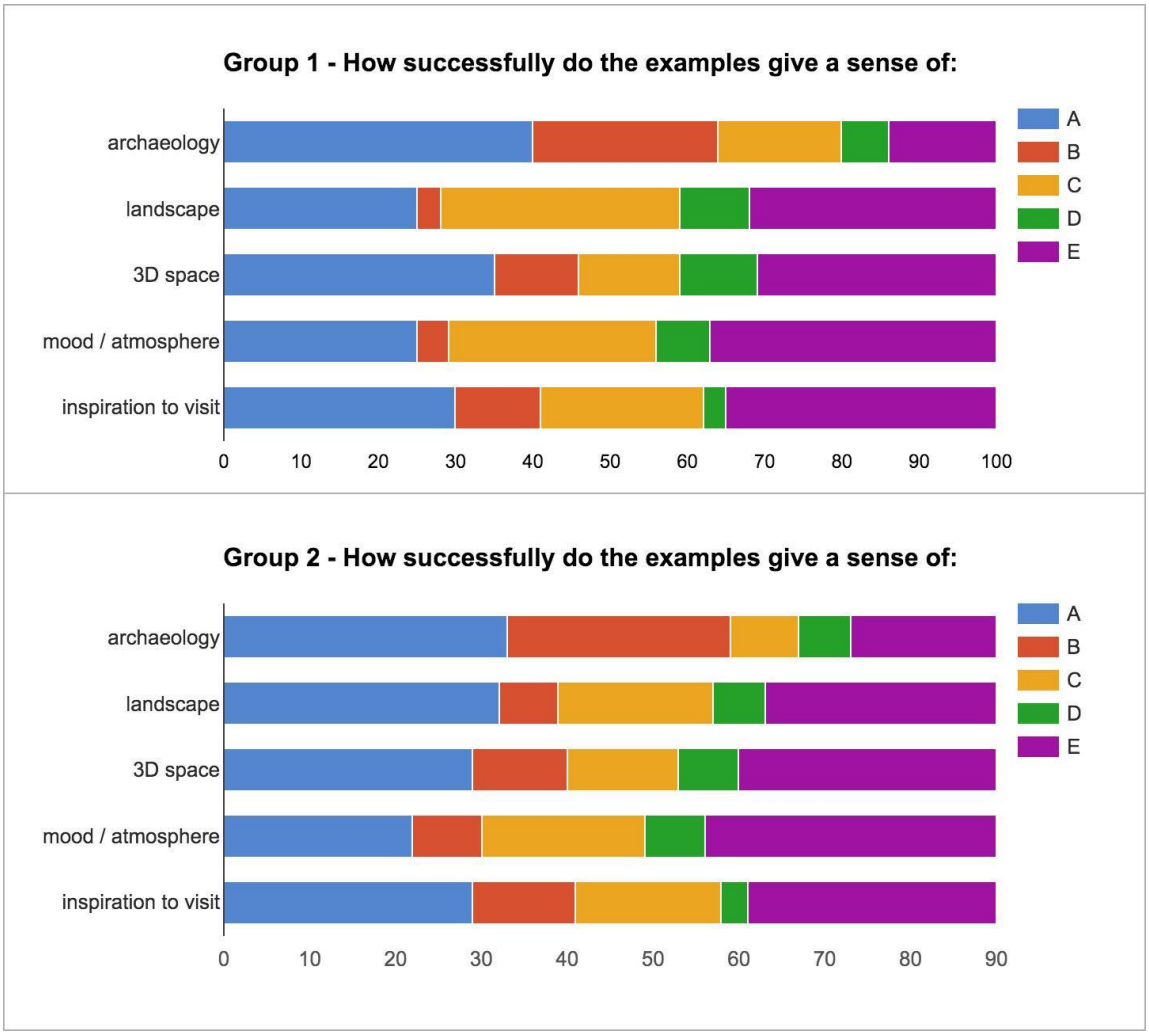


Figure 6.19 - Results of survey comparing five example images against five criteria.

Considering examples A and E only, it is notable that, as expected, the watercolour illustration (example A) scored significantly better with both groups in terms of the archaeological features where the oblique aerial photographs (example E) scored slightly better in terms of mood/atmosphere. In both groups the oblique aerial photographs scored highest in mood/atmosphere than they did against the other criteria, and lowest in archaeological features. These results suggest that, while archaeological features can be accentuated to aid clarity in an illustrated format, photographic images have the capacity to give a strong sense of the mood and atmosphere.

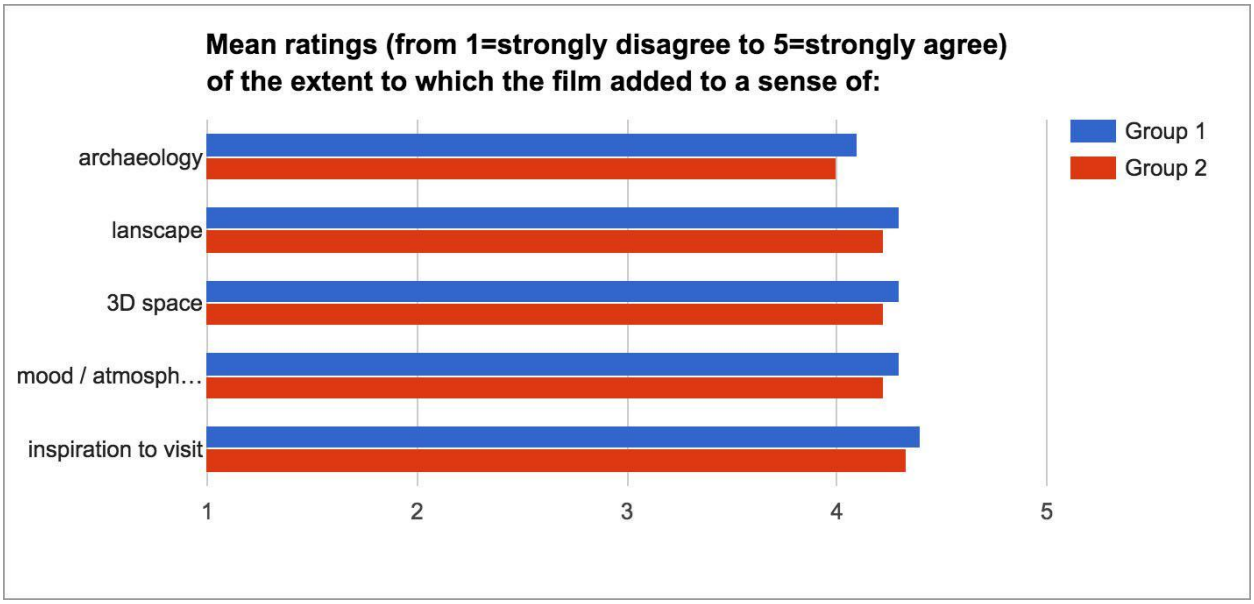


Figure 6.20 - The reported extent to which “The Caterthuns” film added to each of the criteria for both groups.

As already noted there are difficulties in making a comparison between the example images and the film outcome. Despite this we can say that the film was very well received by both groups. When considering the extent to which *The Caterthuns* film added to each of the criteria, both groups scored highly against all criteria (figure 6.20). The results of the survey are indicative that the approach to aerial photography adopted in *The Caterthuns* project can indeed give a better sense of the emotive dimensions of the site when compared to other two-dimensional aerial visualisations. While the illustrated format was shown to give the best sense of the archaeological features of the sites, the oblique photographs and film outcome also held their own in this area, particularly when compared to the orthophoto and orthographic elevation map. These results reinforced the appropriateness and effectiveness of this approach to visualisation as a response to the research questions. In addition to these rated responses, participants were given the opportunity to add additional comments on any aspect of the film. Here are a selection of the responses from both groups:

> “Nice camerawork and transitions!” (participant, group 1)

> “Showing it both with the green fields and snowy weather shows two both very different but very beautiful atmospheres that can be experienced.” (participant, group 1)

> “Absolutely stunning! Brought it alive.” (participant, group 2)

> “Great to see the Caterthuns from the air - makes more sense. I liked the opening close up of the cup marked rock.” (participant, group 2)

These responses reinforce the idea that the film adds to the visualisation on an aesthetic level. Reference to the “close up of the cup marked rock”, the “camerawork and transitions”, and in particular how the summer to winter transitions infer different “atmospheres that can be experienced”, support the idea that the photographic approached used had the intended effect on the viewer.

6.5 Summary

In chapter one it was considered that the oblique aerial view has historically been associated with a more relatable, humanised perspective than the vertical or orthographic plan. The results of the *Visualising the Caterthuns* survey reflect a reported preference for the oblique view. They also show that high oblique aerial photography can give a strong sense of mood and atmosphere when compared with other means of aerial visualisation. These results indicate that the type of photography - based in creative practice - that was used in *The Caterthuns* film is indeed a suitable medium for responding to evocative and experiential aspects of place. The Caterthuns project aimed to respond in practice to the research question of whether creative practice can help bridge the gap between lived experience and the visualisation of landscape heritage. A number of approaches were adopted to achieve this. In a direct sense, steps were taken to incorporate more familiar grounded perspectives represented by the close-up shots and by the inclusion of the human figure. Beyond this the visualisation design was consciously oriented as much around atmosphere as it was around showing the archaeological features. Evening and morning light, as well as snow cover, were used to afford the visualisation a sense of atmosphere and temporality. Such conditions also allow the archaeological features and landscape topography to be seen clearly, as has long been understood by aerial archaeologists. Most importantly, creative practice allowed the research-practitioner to respond to their own experience of spending time at - and above - the site. An approach that was oriented around photography in the field, as a reflexive process which dictated the CGI elements of the film, facilitated this. A more standard approach to visualising a site like the Caterthuns would be to collect imagery suitable for photogrammetry with detailed coverage of the full area of the site. Such a digital model would be very versatile: fly-through shots could be rendered from different angles and artificial lighting could be added. This approach would not allow a response to the dynamic qualities of the site and landscape, nor would it allow for photographic composition to be made in the field. The

intention was to represent a landscape that is not static or fixed, but “constantly transforming in subtle ways” (Watson, 2004: 91). Photographing at different times of day and year allowed for the film outcome to be based on how these changes manifest at the real site, not as a result of digital simulation. To emphasise the dynamic nature of the landscape, shots were used which transitioned between imagery taken at different times, with and without snowfall, drawing from the visual language of timelapse photography. There is a moral, specifically environmental, dimension to this approach that aims to afford the landscape active agency, rather than passive beauty, in the visualisation. This draws from ideas developed by the Land Art movement, with its interest in environmentalism, and also from Postmodern theories - discussed within contemporary landscape archaeology - that attempt to move beyond Modern, Romantic views of landscape and subvert the subject/object divide. At best the film is a correspondence between different active components: the flying camera, the figure engaging with the site, the natural and cultural forces that have together shaped the landscape. In a more pragmatic sense an environmental stance that acknowledges the impermanence of the landscape is appropriate with landscape heritage sites, like the Caterthuns, that are at risk from erosion in an environment now rapidly changing.

The Caterthuns project was designed to respond in practice to the central research question of the relationships between lived experience, visualisation technology and creative practice. The film outcome and textual analysis aim to provide answers to that question and to demonstrate ways in which aerial photography and CGI can be applied creatively to achieve more dynamic and emotive visualisations. One of the methods that facilitated this was revisiting the site with different methods of photography and in different conditions in order to build a fuller impression of the site. The project was an opportunity to experiment with such methods over a long timescale in an environment for research-practice that was completely orientated around the research questions. In contrast, the following supporting case studies emulated a more likely real-world environment for interdisciplinary practice, with limited timescales and multiple stakeholders. These case studies aimed to reinforce the approaches used during *The Caterthuns* project but also to investigate the extent to which they could be useful in different localities and interdisciplinary contexts.

Chapter 7 - Supporting case studies

7.1 Introduction

The following supporting case studies represent collaborations between the research-practitioner, audio-visual creative practitioners, and archaeologists. While the main case study was interdisciplinary in that it involved input and collaboration from archaeological experts, the project was designed around the research criteria of the PhD and the majority of the practice was carried out by the research-practitioner. By contrast the following projects were both designed around wider research questions in archaeological visualisation, and undertaken by teams of practitioners from different backgrounds. The projects themselves responded to questions of how data-gathering differs in the contexts of survey and creative practice, and how visualisation can give voice to ongoing archaeological investigations. For the research-practitioner these case studies also provided a platform to investigate whether the approaches used during *The Caterthuns* project could be translated to different localities and contexts of working.

The site of the Caterthuns was chosen for the main case study because the archaeological features lend themselves to visualisation from the air, and because their dramatic landscape setting is integral to the experience and interpretation of the site. While these attributes are common to many prehistoric sites, the question remains whether this approach to visualisation - orientated around aerial photography as a creative process - could be suitable in other landscapes. These supporting case studies, located in the Earn valley and the island of Westray in Orkney, provided an opportunity to explore this further.

7.2 Approaching Links of Noltland

The location of Links of Noltland at the periphery of the Orkney archipelago is integral to its character. The movement of sand dunes due to exposure to the elements has been central to the story of the site in prehistory and today. Beyond this, the experiences and interpretations of the site are intimately connected to journeys across the surrounding seas. Westray could today be considered remote, requiring a lengthy journey for most, and yet the archaeological record suggests that it occupied a more central position in prehistoric culture, when traveling by coastal routes could be easier than over land. Westray is home to the Pierowall stone, found not far from Links of Noltland. This large enigmatic carved stone is marked with spiral motifs which are peculiar to Scotland but resemble carvings found in Ireland, at the Neolithic site of Newgrange for example.

At Links of Noltland a number of artefacts made of steatite - or soapstone - probably sourced in Shetland, have been found within a Bronze Age context. The architecture, materials and art styles uncovered at Links of Noltland point to a culture well connected to locations further afield (Moore and Wilson, 2011: 29-31). These aspects of the site would form the focus of a collaborative visualisation project conducted by an interdisciplinary team with support from Historic Environment Scotland, who care for the site. This team consisted of archaeologists and digital artists Dr Alice Watterson and Dr Aaron Watson, audio expert Dr John Was, and the research-practitioner.

Figure 7.1 - Links of Noltland and Grobust beach behind. Kite aerial photograph by the research-practitioner, 2014.

Links of Noltland is an ongoing excavation which is being conducted to record and preserve archaeological remains that are at risk from erosion caused by wind-blown sand. The site lies directly behind Grobust beach within a dynamic and exposed coastal environment (figure 7.1). As such the main objective of the visualisation project was to record the site, and the process of excavation, in ways that were not being routinely undertaken as part of the archaeological process. Low altitude aerial photography, filming, audio recording and interviews with the archaeologists were all used to do this. This practice explored the question of how creative approaches can supplement archaeological site recording, and what aspects of the site and

landscape might be missing from standard survey. In particular the imagery that was gathered during fieldwork attempted to connect the site to the broader landscape of Westray, and also to the journeys further afield that are so integral to the interpretation and current day experience of the site. It was considered that the archaeological record does not necessarily communicate the significance of this to a general audience. Watson has previously observed that: “Plans and maps in particular lend themselves to the creation of fixed and immutable perceptions of archaeological sites and landscapes; static, silent, familiar” (2004: 87). This “fixed” perspective is in sharp contrast to the way that landscape is perceived by people, as Ingold describes:

> “Life on the spot surely cannot yield an experience of place, of being some*where*. To be a place, every somewhere must lie on one or several paths of movement to and from places elsewhere.” (Ingold, 2007: 2, original emphasis)

With this in mind the team set out to record images and sound that, in addition to recording the site, also responded to the dynamic nature of the place and its location within the broader environment. To achieve this, the research-practitioner drew from the approaches adopted during the Caterthuns case study. In particular, dynamic camera movements and the visual language of timelapse photography were developed further at Links of Noltland.

7.2.1 Fieldwork

Fieldwork took place in August 2014 to coincide with the season’s excavations, undertaken by *EASE Archaeology* who have been working at the site since 2006. While interviews with the on-site archaeologists, audio recording and ground level filming was being carried out by the other team members, the research-practitioner focused on low level aerial and timelapse photography. Images were taken from kite and pole platforms, with additional timelapses being recorded at ground level. The large scale of the site posed a challenge for recording. Neolithic and Bronze Age structures are spread across an area covering approximately 250 x 150 metres. These structures are at various stages of excavation and are covered over when work is not taking place. Unlike at the Caterthuns, complete photogrammetric coverage was gathered at Links of Noltland. This was in part because it would allow more flexibility later on, and in part because there would be limited opportunity to return under different lighting conditions. To gather imagery for this complete coverage model an automatically panning kite aerial photography rig (driven by a *Gentles ClickPAN* device) was used (figure 7.2). This meant that a large area could be covered quickly with photographs from different angles, suitable for structure-from-motion (SFM)

photogrammetry. This has previously been identified as a suitable method for mapping complex archaeological sites in detail (Verhoeven, 2012).

Figure 7.2 - The automatically panning kite aerial photography rig above the site operated by the research-practitioner who is visible in the background. Photograph taken from a secondary rig looking down the kite line.

Photogrammetric imagery was also gathered outside of the site boundaries at an adjacent rock outcrop at Grobust beach. Timelapse photography was taken from kite and pole platforms covering the beach and the active excavations taking place within the open trenches. In addition, ground based timelapse of the sky and landscape was recorded which would later be incorporated into the aerial views. Kite aerial photography was also taken with particular compositions in mind. This photography was quite unlike that collected for the purposes of the photogrammetric model in that framing and lighting were the main focus, rather than the criteria of three-dimensional coverage and detail.

7.2.2 Lab work

The kite aerial photographs taken for SFM photogrammetry were processed into a digital three-dimensional model using *Agisoft Photoscan*. 594 photographs were used in total, taken in a semi-structured arrangement during a series of traverses across the site. *Photoscan* is able to resolve these camera positions and reconstruct detailed three-dimensional structure by comparing

overlapping images. The resulting digital model can be used in a number of ways, including within an animation workflow. One way in which it can be viewed is as an orthophoto, or orthographically rectified photomontage (figure 7.3). This image is measureable, like a site plan, but shows true colour, like a photograph, so can provide a useful interpretive tool for archaeologists. Due to the high number of photographs used, the resulting orthophoto is very high resolution, equivalent to around 69 megapixels. To navigate such images easily an interface such as the online service *Gigapan* can be used, which streams the required detail allowing the user to freely pan and zoom to areas of interest.

Further to this, the high resolution digital model was imported into the CGI software *Autodesk Maya* where synthetic lighting and other elements of atmosphere and landscape could be augmented. In this environment the site was combined with panoramic imagery of the landscape context taken from the panning kite aerial photography rig. This allowed for oblique views to be rendered, which include the horizon and middle distance. While the addition of synthetic lighting is generally less preferable to the fidelity that comes with photographing real-world lighting conditions - as was done at the Caterthuns - here it allowed the flexibility to digitally animate changing lighting conditions. A simulation of patches of sunlight and shadow moving across the site and landscape was created to give the impression of a timelapse sequence filmed from a moving aerial platform. Despite utilising the same data, this layering and manipulation of elements is quite unlike the more formal visual language used in the construction of the orthophoto.

Figure 7.3 - Orthophoto montage derived from kite aerial photography by the research-practitioner, 2014.

7.2.3 The outcome

The high resolution digital model of the site, additional photogrammetry taken at Grobust beach, the landscape backdrop, and timelapse photography from the kite and at ground level were all combined to create an animated sequence that introduces the site of Links of Noltland as part of a broader, dynamic landscape. This sequence combines a free flying camera, which moves across the shore and descends towards one of the excavated structures, with the visual language of timelapse photography. This was achieved by using some real-world timelapse elements - like the beach and sky background - alongside a simulated effect of rapidly moving clouds casting shadows on the site and landscape (figure 7.4). This outcome suggests the possibility of the creative application of aerial and digital visualisation technologies to respond to the temporal and dynamic dimensions of landscape that were identified at the outset of the case study. The outcome used some material that was gathered using methods common to formal archaeological recording, namely a complete and detailed topographical survey of the site using low altitude aerial photogrammetry. In addition other visual material was gathered with the creative outcome in mind. This included photography and filming beyond the perimeter of the site, and alternative methods like timelapse photography. This case study project demonstrates the ability for survey methods to overlap with creative practice in the visualisation of landscape heritage. Despite this, some of the approaches and methods used both during the fieldwork and lab work differed greatly depending on whether the intention was to create the measurable orthophoto or the animated creative outcome.

Figure 7.4 - Still frames from the animated outcome *"*Approaching Links of Noltland", which features animated sea and sky elements collected in the field.

7.3 SERF hillforts of Strathearn

A series of Iron Age hillforts in the Earn valley are under investigation by the Strathearn Environs and Royal Forteviot (SERF) project run by University of Glasgow. The project aims to better understand the chronology of the prehistoric sites and the factors that contributed to the placement and concentration of sites in the area. A number of hillforts survive as earthworks along the length of the Ochil hills that line the south side of the valley. Other hillfort-type enclosures are found dotted across the lowland within the valley itself, identified in crop and soil marks that appeared during aerial survey of the area. The SERF project has conducted geophysical survey

and excavations at many of these sites. Each year investigations have added to an evolving archaeological understanding of the area. A visualisation project - undertaken in collaboration with Dr Tessa Poller, University of Glasgow, and Dr Alice Watterson - aimed to explore how these changing interpretations of ongoing archaeological investigations could be represented to a public audience by audio-visual means. Similar to the Links of Noltland project, this incorporated interviews and recordings during excavations along with low and high altitude aerial photography that was developed into animated outcomes using CGI. Of particular interest to the research-practitioner was how the experiences of the landscape of Strathearn could be used as a common platform - shared by specialists and non-specialists alike - to communicate evolving archaeological narratives to a public audience.

7.3.1 Fieldwork

Site visits to three of the hillforts were made to coincide with the excavations: Castle Law Forgandenny in April 2014, Ogle hill in April 2015, and Dun Knock in July 2015. Photography from kite, pole and UAV (drone) platforms was collected showing the sites and open trenches (figure 7.5). These images were later incorporated into an interactive interface and were used as the basis for CGI interpretive reconstructions created by Dr Alice Watterson. In addition, high altitude aerial photography from a Cessna 172 light aircraft was collected for the three hillfort sites. One flight in November 2013 incorporated Castle Law Forgandenny, where still images and sequences suitable for structure from motion photogrammetry were taken. Another flight in November 2015 gathered imagery of Dun Knock, Ogle hill and the surrounding hillfort sites of Ben Effery, Castle Craig and Kay Craig. Here photography covering a large area (around 4 x 5 kilometres) was used to build a photogrammetric model of the broader landscape shared by a number of sites. In each case photography was conducted while sunlight was at a low angle, to better show the topography and also to afford a sense of atmosphere in the resulting CGI models.

Figure 7.5 - Castle Law Forgandenny hillfort during excavation. Kite aerial photograph by the research-practitioner, 2014.

7.3.2 Lab work

Based upon the aerial photography collected in the field, animated CGI sequences were developed for the three main hillfort sites. The approach used was similar to that adopted at Links of Noltland where a three-dimensional model of the site was combined with a two-dimensional backdrop to allow for a range of camera movement from an oblique angle. The intention of these sequences was to introduce the archaeology of each site from the perspective of the broader landscape. Camera angles were chosen which showed key features of the landscape such as the abrupt line of hills along the south side of the valley at Castle Law Forgandenny, and the distinctive features of Ben Effrey and Craig Rossie near Ogle Hill. In each case the camera descends to show more detail of the site, and this closer angle then becomes the basis for overlays that show the archaeological features using the site plans or text labels (figure 7.6).

Figure 7.6 - Frames from the “fly-in” CGI animations at Castle Law Forgandenny (top) and Ogle hill (bottom).

7.3.3 The outcome

The animated sequences developed by the research-practitioner formed part of a pilot project to design an interactive interface whereby a public audience can navigate a range of material associated with the SERF sites and archaeological investigations. A mock-up of this interface was demonstrated at a talk and focus group hosted in the village of Dunning, the location of Dun Knock hillfort, in April 2016. Many of the attendees had previously volunteered during the excavations. This provided an opportunity for the archaeologists from the University of Glasgow to report back on post-excavation findings, and for the community to feedback on the visualisation project. Along with informal discussion, a survey was used to gather this feedback. Out of the 29 participants

who completed the survey, Figure 7.7 shows the total positive responses to the question: “Which element were you most interested in? (tick all relevant elements)”. The following elements were showcased in the interactive demonstration:

i. Archaeologist's desk
ii. Map of all the hillforts
iii. Aerial fly-through of Ogle Hill
iv. Aerial fly-through of Castle Law, Forgandenny
v. Survey of the different archaeological features of the fort
vi. Aerial photo showing trench
vii. Artist reconstruction of the stone fort
viii. Artist reconstruction of the different interpretations of how the wall may have looked
ix. Video of excavation with a discussion of the interpretation process by the archaeologists

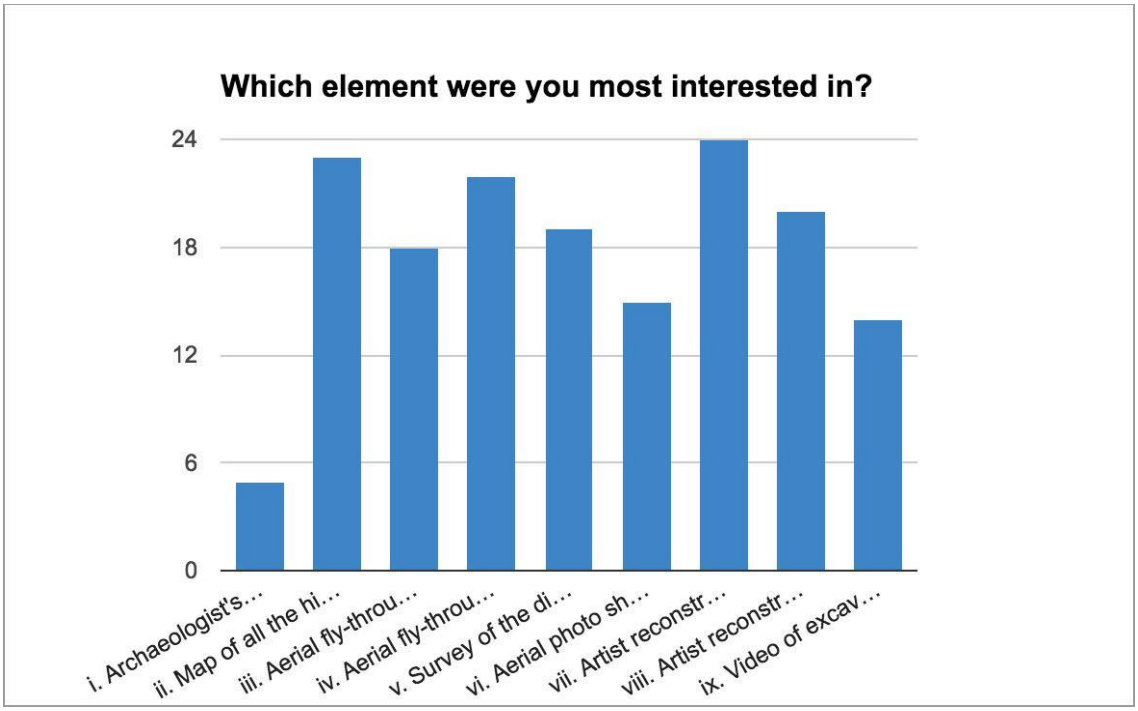


Figure 7.7 - Reported interest in the different elements of the SERF hillforts interactive interface.

These responses suggest that, along with the CGI reconstruction completed by Dr Alice Watterson, the animated aerial view can support the archaeological interpretations in an engaging

way. Interestingly the map view, which shows the broad topography and landmarks of the entire Strathearn area in emblematic form, also scored highly. There was a good response to the animated aerial sequence of Castle Law Forgandenny, which scores slightly better than the - higher altitude - Ogle hill sequence. This feedback supports the hypothesis that aerial view is a fitting platform to introduce specialist archaeological findings, and the evolving interpretations of ongoing excavation, within the context of landscapes that are familiar to the audience.

7.4 Summary

These supporting case studies aimed to develop the ideas and approaches adopted in the Caterthuns project and to test their applicability in different locations and collaborative contexts. At Links of Noltland a combination of established survey methodologies and alternative approaches to recording were used. In this project it is suggested that standard approaches to archaeological site recording incorporate little of the landscape beyond the site itself and the temporal changes in lighting and atmosphere that are key to the experience of the site. Links of Noltland is intrinsically linked to the dynamic environment of which it forms part. It is suggested that creative practice can incorporate these characteristics into visual outcomes while exploiting the visualisation technologies of aerial photography and CGI.

As at Links of Noltland, the interpretations surrounding the hillforts of Strathearn are in continued negotiation while archaeological investigations are ongoing. In this project it was suggested that aerial views can provide a suitable platform to introduce the sites and landscapes that are central to these discussions in a way that is accessible to specialists and general audiences alike. While the elevated view can undoubtedly afford an undue authority to the image, and a distance from grounded experience, it is suggested that the moving camera, the oblique perspective, and carefully considered framing and lighting *can* evoke the experiences related to a site and its place within the broader landscape.

Chapter 8 - Conclusion

8.1 Lived experience and visualisation technologies

At the outset of this thesis a perceived distance between visualisation technologies and the lived experience of landscape heritage was highlighted. Aerial photography and CGI, while useful in providing clarity and overview, have been considered by some to be divorced from the insider's perspectives that come from grounded experience. Such claims are not unfounded. Chapter one explored a number of ways in which aerial photography has been employed in projects of modernisation, in some cases ascribing a worldview that is insensitive to local differences and grounded realities. Macdonald describes this as a "dangerous delusion" that could result in "a loss of human awareness of those things that may only be appreciated from close to, or when 'grounded' or 'immersed'" (2004: 53). This aspect of the aerial view is especially at odds with the interests of landscape archaeologists who are concerned with precisely the "grounded" perspectives that Macdonald mentions. Tilley's statement that the aerial view "is, of course, inhuman" is based upon a physical distance from how we "normally see or experience landscapes" (2008: 272). Chapter four (section 4.5.1) considered the ability for photographic images to transmit experiential dimensions, not because they directly correlate to what is seen, but because they carry meaning within the cultural context of viewing. It has been argued throughout this thesis that aerial photography is also able to reflect the grounded and local perspectives that come with lived experience in this way.

The aerial view resists categorisation as a distanced and disembodied perspective time and again, both within instrumental images (such as those discussed in chapter one) and where it is used in an explicitly artistic context (as shown in chapter two). This is possible because of the cultural context within which such images operate. Aerial photography has indeed been driven by the technologies of photography and flight that were intrinsically linked to a distinctly Modern worldview. Such a view prioritised the global over the local, the ocular over the multisensory, and the mechanised over the natural world. Despite this, the images produced reside in the domain of visual culture where such intentions are quickly subverted. As Castro has pointed out:

> The feeling of flight is as central to the aerial view as is the enjoyment experienced in observing the earth from an unusual point of view or of visually discovering and dominating it. (Castro, 2013: 118)

In addition, the photographs from aircraft and spacecraft that were widely disseminated during the Twentieth Century were also associated with the politics of ecology and environmentalism. Aerial images were central to debates that challenged preconceptions of the relationship between culture and nature (Cosgrove, 2001: 261; Kurgan, 2003: 113). Artist-photographers like Emmet Gowin have vividly narrated these issues using aerial photography as a medium. Chapter two explored the ways in which the aerial view has been used in the context of creative practice to engage with the emotional and experiential dimensions of landscape. It was suggested that the inherent tensions between distance and intimacy, or strangeness and familiarity, that exist within the aerial view, are not a necessarily a hindrance but instead can represent a powerful tool to visualise landscape from an emotive and aesthetic perspective. Creative practice is uniquely positioned to take advantage of these cultural connotations. It was upon this hypothesis that the research-practice was based.

Aerial photography and CGI have been regarded here as related, technologically facilitated visualisation tools. In the introduction it was highlighted that just as aerial images have been considered to offer a distanced and disembodied view, so digital imaging may “reduce the past to a pattern of pixels, viewed on a screen of modern rationalism” (Thomas, 2004: 201). As such CGI risks representing a remote and detached view of landscape heritage that remains virtual despite the appearance of realism. Just as with aerial photography, digital technologies that have been championed for their rational and revealing accuracy also take on diverse meanings in the context of visual culture. Particularly in the fields of film and visual effects the ability for CGI to carry narratives and aesthetic qualities rooted in the real world subverts the mechanised and virtual nature of the technology. Within the research-practice methods were adopted from archaeological survey and combined with workflows, approaches and a visual language more common in film, animation and visual effects. Here it is argued - through theory and practice - that the emotional, multisensory and dynamic dimensions of landscape heritage can be communicated to a public audience by the creative application of aerial photography and digital visualisation.

8.2 The contribution of creative practice

Chapters two, three and four explore the work of aerial photographers, digital media artists and archaeologists who have used creative practice to respond to their experiences of landscape. This thesis set out to demonstrate the ability for such approaches to improve the visualisation of landscape heritage in an interdisciplinary context. It is suggested that, while theoretical argument is a good way to identify the issues and establish the context of such work, the solutions lie in

practice itself. As such the outcomes of the research-practice aim above all to respond to the research question. The specifics of the methods and workflows used are not in themselves the contribution here. Instead the contribution is a demonstration, in theory and practice, of the viability of a novel approach to the visualisation of landscape heritage.

Previous interdisciplinary collaborations explored the incorporation of Ingold's "dwelling perspective" into digital visualisations which foregrounded creative practice (Watterson et al., 2014). This approach is based on the premise that the creative practitioner's own experience of a site and landscape leaves an impression upon the visual artefacts produced. This is less true in other forms of site recording where personal impressions are discouraged and obscured, by the formal visual syntax of survey for example. In archaeology, the debates surrounding the application of CGI have centred around issues of authority, and the representation of uncertainty. Within the art world - and in particular the illusionary art that film and visual effects relates to - these concerns are rarely relevant. The creative practitioner accepts that the images they produce are not *the* truth, but that they tell conceptual or narrative truths within their subjective meaning (Meyer, 1997). In this respect, scientific and artistic worldviews are very different, as Mithen describes:

> "Archaeologists have a responsibility to make statements that go beyond one's own personal experiences and subjective beliefs; artists have no such constraints - it is legitimate for them to indulge in self expression. Indeed it is what they are supposed to do." (Mithen, 2004: 166)

While there is a need for these personal, subjective experiences to be identified and isolated in any claims to new empirical knowledge within archaeology, these personal perspectives are crucial to creative practice, and also to successful public outreach. It is through these perspectives that the aesthetic, emotive and dynamic dimensions of landscape can be incorporated into visualisations. These dimensions, and the lived experience of landscape heritage that they elude to, can provide a powerful platform for communicating specialist archaeological knowledge to a general audience.

8.3 Impact

One of the benefits of practice-based research is that the research outcomes can often be easily communicated outside of an academic context. As noted in chapter six (section 6.4.1) the short

film outcome *The Caterthuns* was well received by both experts and a general audience. The *Visualising the Caterthuns* survey suggested that the film outcome is likely to encourage the audience to visit, or revisit, the site. It is hoped that the successful communication of the archaeological narrative, but also the mood and atmosphere of the site, will lead to a deeper appreciation of the cultural and aesthetic significance of such places. Beyond the case studies detailed here, the research has also directly filtered into a number of public interpretation projects in the heritage sector. Since 2012 the author has supplied low level aerial photography for interpretation panels and publications commissioned by Historic Environment Scotland. These photographs have been used as key images on more than 20 on-site interpretation panels across Scotland, ranging from Shetland to Dumfries and Galloway (figure 8.1).

Figure 8.1 - A Historic Environment Scotland interpretation panel at Dunadd hillfort, Kilmartin Glen, which features a low level aerial photograph taken by the research-practitioner. Photograph by Nuria Valdeon, 2012.

Here aerial photography is being used for specific interpretive purposes both to orientate the visitor to the features of the site and also to evoke a suitable mood and atmosphere in order to better tell the stories associated with the place. The low altitude aerial view (using kite and UAV platforms) is particularly suitable for this as it can give a better sense of three-dimensional space, but also allows for the inclusion of the surrounding landscape and sky. The approaches developed during the research are key to the success of such images. They are not simply intended to

illustrate the topography of the archaeology they depict. Instead they attempt to visualise the human stories, cultural significance and relationship between the site and the surrounding landscape. One of the ways that this is achieved is by combining CGI reconstructed elements with aerial photography. Here semi-transparent or “ghosted” representations of the lost structures are superimposed onto low altitude aerial views to help the visitor envisage how the past architecture relates to the current day site (figure 8.2). Lighting and composition is carefully arranged to provide an atmospherically rich platform for telling these stories.

Figure 8.2 - A low level aerial photograph and “ghosted” CGI reconstruction of lost buildings at Whithorn Priory, supplied by the research-practitioner for Historic Environment Scotland interpretation panel, 2015.

Moving image visualisations that draw from the research findings have also been used in heritage interpretation for a public audience. The short film outcome of the pilot project *Jarlshof* is on permanent display in the on-site museum at Jarlshof, Shetland, which is cared for by Historic

Environment Scotland (see Baxter, 2014). A short film completed in collaboration with Dr Alice Watterson, *Above the Law*, formed part of the *Reflections on Celts* exhibition held at McManus Galleries, Dundee, from August 2016 to March 2017 (figure 8.3). The film tells the story of the Iron Age hillfort site at Dundee Law using aerial and digital reconstruction of the past landscape juxtaposed with digitised artifacts associated with the site.

Figure 8.3 - The short film “Above the Law” displayed as part of the “Reflections on Celts” exhibition held at McManus Galleries, Dundee, photograph by the author, 2017.

The results of this research have been shown to translate well outside of an academic context, supporting the idea that theoretically grounded practice is of benefit to experts and non-experts alike. This research makes a case for creative practice to be used as a means to communicate specialist archaeological knowledge, outside of the discipline, for a general audience. The ability for creative practice to generate more compelling visualisations could also be useful in other fields where public dissemination of findings is obscured by the opacity of specialist textual and visual language.

8.4 Future directions

Aerial photography has long challenged perceptions of the environment, and has been an intrinsic part of the development of the ecological and environmental movements of the Twentieth Century.

Images of the Earth from above have revealed the fragility and interconnectedness of the natural world, and formed the backdrop of debates over whether the environment should be regarded as resource to be managed, or a domain of insurmountable natural forces. These debates are often rooted in political ideology as much as they are founded on empirical science. Here the research-practice has adopted an implicitly environmental stance that attempts to show the landscape as a dynamic entity in constant flux, not a fixed resource to be taken for granted. Much of Scotland's landscape heritage can be considered at risk from erosion caused by sea level rise, land use and loss of biodiversity caused by local and global human activity. These rapid changes to the contemporary environment are made particularly striking in the context of the antiquity of prehistoric remains. These stories will become increasingly important to communicate to a broad audience as the effects of manmade climate change begin to be widely felt. The environmental issues facing contemporary culture relate to both discrete local environments but also to a global ecological system. The rapid melting of glacial landscapes in the Arctic for example (figure 8.4) are caused by cumulative human activity across the globe. The far-reaching implications of these changes are proving difficult to bring into public debate in a relevant and meaningful way. Aerial and digital visualisation are likely to play an important part in these debates. While maps, satellite and aerial views remain the predominant ways of visualising landscapes, without consideration of how these modes of vision operate in a cultural context there is a risk that environmental narratives will remain distanced, intangible, and removed from the immediacy of lived experience.

Figure 8.4 - Skaftafellsjökull in Iceland is among the vast majority of glaciers that are retreating as a result of manmade climate change. Aerial photograph by the author, 2016.

One future direction for this research would explore how the approaches used to visualise archaeological narratives in a more humanised manner could be used to enhance and enrich the visualisation of natural heritage and physical geography. Macdonald suggests that aerial photography *can* operate beyond a distinctly Modern paradigm that reinforces the nature/culture and subject/object divides, and is ill equipped to deal with the system of interdependent relations that is integral to landscape (2005). This raises the possibility of departing from the Romantic concept of a passive landscape - the object of subjective observation - to a view that foregrounds the interactions of different forces and agents within the environment. This view of landscape, as an active agent within the correspondence that forms our perception of place, has been legitimised by phenomenological thinkers such as Merleau-Ponty. It is in this context that creative practice could make a contribution to the aerial and digital visualisation of the environment. This thesis aims to demonstrate how the creative application of visualisation technologies in an interdisciplinary context can improve communication between specialists and non-specialists. Beyond this it explores how theoretically grounded practice and practice-based research can make valuable contributions in this area.

8.5 Concluding points

Technology is driven by market forces. It should be the role of creative practice to challenge and subvert the assumptions and conventions of image-making technologies (Sherman, 1988, quoted in 2016), not to act as an unwitting advocate for the commercial interests of the industries behind them. The latter all too often seems to be the case with CGI software and commercial drones in particular, where much enthusiasm surrounds technological development with little consideration of the true benefits and cultural connotations of the *meaning* that such technologies produce. For the creative application of visualisation technology to meet its full potential it is also important that the fields of scientific visualisation/survey are not conflated with the process of interpretation for a public audience. Despite an overlap in the hardware and software technologies used, the scientific pursuit of objective representation, and the communication of meaning across disciplinary boundaries, require completely different approaches and criteria for success.

This thesis has attempted to place contemporary aerial photography and CGI practice within a relevant historical and theoretical context, with a particular focus on the domain of visual culture. It has been argued that the tensions between visualisation technologies and the lived experience of landscape heritage can be successfully negotiated using creative practice. When applied creatively, aerial photography and CGI can be used to visualise the emotive, multisensory and aesthetic dimensions of sites and landscapes that are often missing from formal survey. This is significant because aerial and digital visualisations also afford a powerful and revealing platform for representing sites and landscapes with topographical clarity and overview. These two aspects of the aerial view are referred to by artist-photographer Emmet Gowin:

> “At times, we may also look for an architecture of light and a poetry of atmosphere which welcomes the eye into a landscape of natural process. It may also be the map - the evidence of the thing itself; may it also, always be a vision of the double world - the world of appearances and the invisible world all at once.” (Gowin, 1994, quoted in 2002a)

The two worlds that Gowin describes have been referred to here as the domains of topographic representation, or naturalistic appearance, on the one hand and the aesthetic and emotive dimensions - such as those evoked by the *feeling* of landscape and flight - on the other. Both of these worlds are integral parts of landscape. “[O]n top of all these visible phenomena, landscape also includes the invisible”, explains Jóhannesdóttir, “relationships which emerge in people’s actions, movements, speech, thoughts, imaginations and narratives are intertwined with the

visual" (2010: 114-115). Cox defines visualisation as "the process of making the invisible visible" and extends this definition to both "scientific data" and "information visualization". "[T]he process of making the cognitive imagination visual using available and culturally dominant technologies", she says, "is one of the most consistent behaviors of mankind" (Cox, 2006: 89). Here it has been argued that creative practice is uniquely positioned to visualise the invisible dimensions of landscape. This is because, as Mithen points out, it is "legitimate for [artists] to indulge in self expression" (2004: 166). By embracing the influence of personal experience upon the visual artefacts produced, creative practice is well equipped to deal with the aesthetic and emotive dimensions of landscape. In order for this to be successful, consideration must be made as to the ways in which practitioners engage with the landscapes they are visualising (Watterson et al., 2014). The insider's, or dwelling perspective that comes from familiarity with a place will always be preferable to a distanced, outsider's view.

Where some landscape archaeologists have focussed on the visualisation technologies themselves as a source of detachment from lived, or embodied experience, here it is argued that it is the approach and theoretical premise of practice - not the choice of technologies - that is paramount. Jeffrey agrees that digital models tend to "create an apparently sanitised, distancing and disengaging artefact", but also argues that the intangible "aura" of the physical artefacts of cultural heritage *can* transmit to their CGI counterparts (2015: 146). He goes on to suggest that forging more meaningful collaborations with creative practitioners could be one way to foreground these characteristics in heritage visualisations. Here it has been argued that the visualisation technologies of aerial photography and CGI have in fact always moved between the worlds of topographic representation and the emotive, aesthetic world of feeling. In the latter, meanings are read, not according to a formal visual syntax, but within the context of visual culture. It is within this cultural domain that this thesis has attempted to better understand the role and function of aerial and digital visualisation in theory and practice. Images produced in this way implicitly create layers of meaning inherited from cultural understandings, and the viewer's prior experience of landscape, cultural heritage, digital media and flight. Creative practice is uniquely positioned to navigate this terrain.

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Appendix A - Artist interviews

The following e-mail interviews were conducted by the author in order to better understand the approaches of three artists who work with aerial and archaeological subject matter: Dr Patricia Macdonald, Marilyn Bridges, and Dr Aaron Watson.

Email interview with Dr Patricia Macdonald, April 2013

> *KB: Hi Patricia,*
>
> *Hope you are well and thanks again for taking time for my questions. I have gone ahead and compiled some more specific thoughts and questions below. As you say the theoretical "terrain" surrounding aerial photography is a complex one, and I agree that it is the relationships between various strands of theory and practice which may be particularly interesting.*
>
> *While there are many areas I would be keen to discuss, including the editorial aspect of your work, for the time being it may be useful to focus in on your use of aerial photography as an art medium; for example the pieces compiled in the 2001 "Airworks" exhibition and book. Below is a brief preamble to give a feel for where I am coming from, and some questions arising at the moment. While I'm aware this is rather broad, I am more keen to hear your own thoughts so please answer however suits.*
>
> *I am interested in how what you have termed the "comprehensive" nature of the aerial view may, in some manifestations, may inherit a "specular" (Thomas, 1993: 25) tendency to distance and reduce landscape according to a privileged gaze. In your interview with Dr Sara Stevenson (2004: 53) you referred to the relationship between these two interrelated, yet somewhat opposing, aspects, and to the dangers of the latter interpretation of the "god-like view".*

PM: The 'opposing aspects' of aerial photography (hereafter AP) that particularly interest me in an art context are what I have termed (1) its 'comprehensiveness' and (2) its tendency towards 'abstraction-related ambiguity', and the - often useful in an art-based sense - tensions between these. What Thomas refers to as 'specular' relates directly to 'comprehensiveness' and the features associated with this (the much-discussed 'god-like' view - emphasis firmly on the '-like', as discussed elsewhere by myself and many others). See commentaries on the 'Enlightenment' idea of the 'panopticon'. 'Comprehensiveness' is obviously useful editorially in AP (see various refs) but is a slippery idea, to say the least.

KB: Your own work - which you have described as being "located partly within the deconstructive, but mainly within the reconstructive ..." (2005: 89) - very clearly departs from these reductive, cartographic characteristics.

PM: Yes, that is my intention at least. See Gablik for more on these deconstructive and reconstructive strands of work - op. Cit.

KB: My questions aim to understand what effect, if any, these inherited properties have upon your use of aerial photography as an art medium; and what factors contribute to your successful departure from them.

Firstly, do you find that working with the aerial view in general is subject to these residual tendencies towards a reductive, privileged gaze?

PM: This goes with the territory, but in most of my artworks in the medium I am searching for ways to get past this, or to employ it in a useful way in what I am trying to say.

KB: You have suggested that the physical and emotional experience of flight in a light aircraft affects your stance as an observer (2004: 53). Could you elaborate upon this?

PM: See my comments in the History of Photography conversation on the combination of 'gazing' (in a meditative sense, not using the word in the sense of 'domination' by an observer, rather the opposite), and 'glancing', as in 'fleeting g...' - inevitable given a rapidly-moving platform. But - see also below - this does NOT relate to phenomenological concerns (as discussed by, eg. Thomas) which are about the experiences of others, not my own experience as an observer.

KB: Some of the locations which you work with are familiar, even iconic landmarks (e.g. Schiehallion, Edinburgh city centre, etc.) while others are more anonymous. How do you compare approaching sites from the air which you are perhaps already familiar with from ground-level experience, to encountering locations for the first time from above?

PM: There are different ways in which to be 'familiar' with a place and its many interconnections - but clearly, any prior knowledge/ experience will affect how one sees that place. So people may be familiar or unfamiliar with a place/subject in different ways - an abiding problem for communication, but exciting too...

KB: Of the many levels of interpretation related to your composite pieces - such as "The Play Grounds series, No 6" (1998-99) - I am particularly interested in how viewing multiple perspectives simultaneously departs from a singular vision, more often associated with the aerial, and perhaps draws attention to the observer's (transient) point of view. How does this method, as you put it of "sampling" (2005: 93) a multifaceted landscape (perhaps quite distinct from the process of "capturing"), relate to the

"comprehensive" tendency of the elevated view to summarise the whole in a single image?

PM: An adequate answer to this is hard to summarise. But one important point, if you are considering pieces such as The Play grounds no 6, is that I am not trying here to 'draw attention' to the observer's point of view, but to the point of view of one part of the subject, in this case the hunted grouse - see the JVAP article. And another thing I am saying once again, I think, by employing the 'sampling' method (Krauss's term, q.v.), is that the 'comprehensiveness' of the AP is an illusion, if a powerful and seductive one. And I think there is no question - or intention for me anyway - of 'capturing' anything, as I sense you already understand. We are definitely the sparrow flying through the lighted hall...

KB: In some of your other pieces the observer is more literally brought into the picture in different ways, such as "Shadow self-portraits" (2000-2001) and "Heavy cumulus cloud [...] and wing of observation aircraft" (2000). Is the suggestion of an embodied perspective - in these and the large composite pieces - (affected), or contrasted, by the physical inaccessibility and distance of the aerial perspective?

PM: Yes and yes, but, as above, this is not really the point - rather, in this case, to draw attention to the fact that certain problems are at least being observed - even if that observation, alone, is not enough to be useful.

KB: I hope that these questions may be useful for discussion and please let me know if I can clarify my meaning in any area. Many thanks again for taking the time to consider these and I look forward to hearing your thoughts.

PM: Do come back on any of this - I am very conscious of all that I have not time to say - and what I have said may be unclear - there is so much background. The JVAP refs may take you towards some of it ... Hope this all helps.

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Email interview with Marilyn Bridges, September 2016

KB: Hi Marilyn,

Thanks for your response and for taking the time for my questions which I have compiled below. There is a lot here but I am more interested to hear your thoughts so feel free to answer how you wish, skip or append the questions etc. Also please let me know if I can clarify my meaning on any of this.

Aerial photography has of course been used in many ways and has inherited its own cultural connotations. For example it is sometimes described as "synoptic" or distanced from personal experience. Your own work has a sensitivity to the landscape and a sense of "intimacy" that sets it apart from other air views. When using aerial photography as a medium do these inherent tendencies ever work against you? How do you mitigate the distance of the aerial view?

MB: My sensitivity to the landscape as well as the constraints of aerial photography rarely work against me. Quite the contrary. For example, if I want to make a more inclusive image of a large site, such as Uxmal or the Nazca lines, I just go up higher to take the photo. I can still have a sense of intimacy without being right on top of something, especially when I want to show the placement of the object within the landscape. Whether the object is a pyramid or a natural feature, there are times when I also need to pull back or gain altitude or shoot at a less inclined angle. My signature aim remains consistent, based on the framing, lighting, and sense of stillness and composition

KB: While flying can of course be a serene experience there is also considerable noise, draught and motion associated with flying in a light aircraft at low altitude. You have commented on feelings of both freedom and danger while working from the air. In terms of both individual compositions and the broader direction of your projects as a whole, how have these sensations of flight affected your work?

MB: The door of the aircraft is usually removed, and I'm secured only by a seatbelt. As the turbulent air rushes by I have to concentrate on keeping my camera out of the slipstream. At such times, I usually feel the danger, but the need to make the right photograph dominates it. The sensations of flight at times have affected my work. For instance, if the subject is on the side of a mountain where downdrafts are hazardous, I do the best I can to work around the problem. Usually that means less slowing down, less time to make the image, and knowing when to give the aircraft more power to get out safely. Thinking about both the photograph and the aircraft takes intense concentration.

KB: When working with prehistoric sites and ancient monuments, how important is it for you to visit these sites on foot? Does one experience prepare you for the other?

MB: It's always better to see a site from the ground before flying over it. In some cases however, that's impractical or almost impossible. Some archaeological sites are off limits. The Nazca lines can only be seen from a heightened point of view. If I have the luxury of visiting a site on foot, I usually get a better sense of the optimal lighting, time of day, and points of interest for aerial shots. In some cases I've visited a site only after shooting it from the air, and I have the strange sensation of walking around in my own photograph.

> *KB: Many, if not all, of the ancient sites that you have photographed are under threat from human impact in one form or another. In archaeology much effort goes into surveying monuments under threat, now using digital technology at high resolutions, and yet I feel that your work records much that is missing from an archaeological survey. Can you elaborate on the role of your work as a record of such ephemeral ancient monuments?*

MB: Subtle topographic features may appear in an aerial photograph taken at low sun angle. The earth sometimes seems to appear almost translucent with ghostly markings from below, when the lighting is optimal. Such features, including traces of buried buildings or roads, might not be recorded in an archaeological survey on the ground. What surveys often miss is the integration of an ancient site within the landscape.

> *KB: There is a concern within landscape archaeology that while we are preoccupied with technological survey methods we lose sight of the value of these sites as places. Do you share these concerns towards the sites that you have worked with?*

MB: In the 19th and early 20th centuries, explorers and archaeologists knew more about how to write and to feel, in my opinion. Their photographs often had local laborers in them, not only to show the scale but to include the descendants of the ancient inhabitants. Modern academic orthodoxy tends to discourage the expression of artistic sensibility, and photos use meter sticks for scale. Dry scientific papers describe archaeological sites dispassionately. Some modern restorations by archaeologists have absolutely ruined the aesthetic beauty of a site. Look at the cement cover that was reported this week for sections of the Great Wall of China. The Sphinx of Giza that I photographed in 1984 is much more romantic than the one I photographed only ten years later, after an off-scale "restoration". When I first saw ancient Sardis in Turkey from the air, it was so badly defiled by the "restoration" that it made me heartsick. Mycenae in Greece, now interlaced with asphalt pathways for tourist access, is hard to appreciate. Fortunately, I photographed it before, as well as after these changes. Ancient mounds in Ohio are now parts of trailer parks and golf courses. I could make a discouraging list from around the world. Some countries have been much better at preserving their heritage. The locals often know how to restore ruins using traditional materials, with much better results than "restorations" using modern materials and methods.

KB: Lastly is there anything that you want to add in relation to these subjects?

MB: Fortunately, there are still more ruins that have not been poorly "restored". It's important to document as many of them as possible while there's still time.

Email interview with Dr Aaron Watson, March 2017

KB: Hi Aaron,

Thanks for taking the time to answer my questions which I've compiled below. These are meant as prompts as I am more interested to hear your thoughts so please answer in whatever you way you wish.

From your many archaeological/artwork crossovers I would like to focus here on your photography and audio-visual work, and particularly the relationship between lived experience and the images/video that you produce. We have worked on projects together and discussed the ideas behind your work before, so my questions are meant to refresh and clarify my understanding of how you approach this type of work.

Taking your photographic work first of all, is it fair to say that there is some paradox between the multisensory nature of how places are experienced on the one hand, and the ocular nature of the photograph on the other? If so, does this matter? How do you mitigate for such tensions in your work?

AW: Yes, there is a paradox but this is not traditionally acknowledged in the construction of archaeological knowledge. By mobilising photography in both conventional (e.g. excavation recording) or unexpected (e.g. collage) ways I both find out more about how the medium is used and its effects. This approach might even reveal the paradoxes, make them visible. It would be tempting to transcend the photograph altogether, but then we might have to ask whether I was still doing archaeology. For as long as I remain in a dialogue with archaeology, then the photograph has to play a part because it is a core method through which we document and reproduce the past. Otherwise, I might as well practice art in a way that need not be informed by the project of archaeology.

I think these tensions are actually important. I'm not sure I want to mitigate or hide them. I do wonder whether it is even a good idea to be seeking an 'ideal' means of conceptualising past lives — there should be no single prevailing methodology — or a single explanation. I'll try to illustrate this using aerial views, as this is something we have discussed before. When we create a view looking down upon a building or landscape from on high we have something of a conundrum. On the one hand we can acknowledge that the aerial photograph reveals things we might not otherwise apprehend (e.g. crop marks) alongside the spatial relations between things, or the totality of a structures groundplan which might be occluded from ground level. But on

another we can be certain that past peoples would not have shared this perspective. Perhaps the precise configuration of monuments was not even of significance to their users, and meaning was revealed though a sequence of partial encounters as people moved through time-space. Thus, the aerial view is at the same time helpful to the analytical work of archaeology, while at the same time presenting an abstracted and modern perspective which likely takes us further away from anything people experienced in the distant past. The aerial gaze might distance us from the embodied lives of people, and yet it is highly informative in an analytical way to the process of archaeology. Does this mean we should not utilise the aerial perspective at all? No, but I would suggest that we might need to acknowledge the privileges it affords and simultaneously employ alternative ways of seeing that reveal quite different experiences — even if they are conflicting or contradictory.

> *KB: Your photographic sequences and animated "trans-scapes" respond to three-dimensional space and movement in a way that would be difficult to represent in a single static picture. Why is important for you to represent these elements of time and space in the context of archaeological sites? What does it add?*
>
> *When filming and photographing "trans-scape" sequences, what is the relationship between your own engagement with the landscape and the resulting imagery? Are you recording the site, or recording the walk, or both?*

AW: These methods offer a means of de-stabilising the authority invested in the photograph, while also exceeding the possibilities of conventional film (which is essentially a succession of still images shown in rapid succession). Indeed, it would be difficult to reproduce many trans-scape subjects using a video camera. Trans-scape seeks to arrest the work of image-making and spatial negotiation back from the camera (a technology) and into the hands of the user (a human). Trans-scape offers a way of moving through places or landscapes that is dependent upon the conscious and planned engagement of the camera operator — the performance of a closely prescribed method. The more ambitious trans-scape's can extend over many miles of landscape and can take hours to create. This is revealed in the post-produced animation by accelerating the speed of the playback — revealing not only the changing weather and light but also the changing qualities of places as we move towards them, pass by, and then see them recede into the distance. There is something of the spatial revelation of cubism in this acknowledgement of time, space and form that is unachievable through still photography. It is utterly unlike the automation of time-lapse, which usually has a fixed and situated perspective where the practitioner need not even be present. Trans-scape's capture the changing form of a place through time-space. They are therefore neither the walk, nor the place, but an action. They are, to borrow a title from Richard Long, 'where the walk meets the place'.

Most trans-scape involve the operator as a participant at every moment because I usually have to physically be there to press the button on the camera to capture that moment. I have never been especially interested in automating this process. Collectively those moments converge into a record of my movement — in most cases a walk. My physical presence in that landscape is therefore a requirement — I cannot usually reproduce the effect by proxy using mechanised

transport. This is not to say that trans-scape's cannot be achieved via automation, or through the use of vehicles, but this will tend to record the path of that vehicle along a pre-determined trajectory such as a road, flight path or shipping lane. Hand-held trans-scape's are more concerned with negotiating the land or a place as they reveal themselves on the ground. In this sense it has more in common with cubism by also acknowledging the act of human participation in observation and movement.

An interesting question is the relationship between trans-scape and photogrammetry. I'm still working this one through, but there are clearly similarities. Indeed, trans-scape sequences captured years before photogrammetry was invented can now be processed using 'structure from motion' software algorithms into three-dimensional point clouds. The key difference is that those point clouds are the digital translation of those embodied experiences into abstracted data which exists outside of time or place. These points of data are no longer situated in that landscape; but are no-where. So, while the act of recording a photogrammetric model using a hand-held camera does has parallels in both cubism and trans-scape, a key difference might be that the this method is usually performed in order to generate an abstract digital model that can be manipulated inside a computer, or reproduced in entirely decontextualised physical form using 3D printing.

> *KB: In past discussions we have talked about the influence of the visual modes of Cubism, and also David Hockney's photographic collages in particular. Can you elaborate on what relation these influences have to your work?*

AW: Cubism intrigues me for many reasons, both aesthetic and conceptual. One aspect is that it places the responsibility of 'looking' back upon the observer. There is no passive gaze in cubism. You can't just look through an apparatus like a camera, telescope or microscope and press a button to make a cubist picture. Simply 'pressing a button' places the observer outside of the observed, like looking in through the frame of a landscape painting — you're seeing from a position of no-where into a distorted representation of the world that is organised according to the laws of perspective. Cubism takes the process of looking and re-incorporates this act within a painting or collage that is itself two-dimensional and static. It embeds time into the image — both the time it takes to do the looking and also the time to assemble the image. This reveals both layering and human creativity. Many mechanical representations of the world are made in an instant — the photograph being pre-eminent. But looking is about so much more — our eyes flicker around our surroundings, continually refocusing so automatically that we are unaware of it happening. In the way we see there is no single point of perspective. In a way, it could be suggested that cubism offers a more embodied and therefore human way of seeing, whereas a photograph is an abstracted depiction that removes all of the sensory experiences that ultimately bring meaning into the world. I think that the former approach is more likely to assist us in understanding how people throughout time have negotiated, and participated in, their environment.

KB: Lastly is there anything else in this area that you want to add or expand upon?

AW: Archaeology is situated within a post-Enlightenment philosophical framework. Its methodologies are preoccupied with objectified data gathering within a scientific and evidential constructed paradigm. This seeks patterns in the archaeological record which might then allow us to interpret peoples' actions in the past. Photography is part of this process, as it aligns with requirements to classify evidence in specific ways. Perhaps the greatest danger in using scientific and objectified approaches alone is that they serve to impose our own ways of thinking upon the past, even though we are aware that past people are likely to have understood their world in quite different ways to how we understand ours.

But I'm not interested in simply rejecting current archaeological approaches because they reflect modern ways of rationalising things. If we were to abandon them altogether, archaeology as we know it might not even be able to function. Instead, I'd prefer to work with, and simultaneously subvert, these approaches. Juxtaposing convention with other ways of approaching archaeological material might reveal ways of understanding and interpreting that are made absent by more familiar methodologies.

Our interpretations need not always agree, or even reveal a single 'truth' about the past. It might even be stronger to have multiple interpretations resulting from diverse approaches. In this way archaeology could be in a continual dialogue with itself and its methods, thereby acknowledging broader possibilities for human experience and better accommodating the potential for unfamiliarity and otherness in past lives.

Appendix B - Visualising the Caterthuns questionnaire

Visualising the Caterthuns study - Participant information sheet

About the study

You are being asked to participate in a study which aims to better understand the different ways of visualising Scotland's prehistoric monuments. The results of this study will form part of Kieran Baxter's PhD research at Duncan of Jordanstone Collage of Art and Design, University of Dundee. If you choose to participate in the study you will first be asked to sign a participant informed consent form to confirm that you are happy with the information below about the study and how the data you provide will be used.

Kieran Baxter will be glad to answer questions about this study at any time. You may contact him at: k.a.baxter@dundee.ac.uk

The academic supervisor for this project is Elaine Shemilt. You may contact her at: e.shemilt@dundee.ac.uk

What the study involves

You will first be asked to look at five examples of still images that visualise the site of two prehistoric monuments. You will be asked to rate the images against a number of criteria. Secondly you will be asked to watch a short computer animated film which visualises the same site. You will then be asked to to rate the film against the same criteria in reference to the images.

You will be asked questions relating to how informative the examples are and also how emotionally engaging you find them. It doesn't matter whether or not you are already familiar with the site and the archaeological interpretation of the monuments although to help the study will be asked about this.

The study will require around 30 minutes of your time. You may decide to stop being a part of the research study at any time without explanation. There are no known risks to you in this study.

How the data you provide will be used

The data that you will provide from the study will not be linked back to you. Once the data is collected it will be analysed as part of Kieran Baxter's doctoral studies at Duncan of Jordanstone Collage of Art and Design, University of Dundee. Once collected the questionnaires will be anonymised so that the answers you give are no longer connected to your name or identity. The results of the study may be included in the PhD thesis and other academic publications. The completed questionnaires will be destroyed on completion of the PhD.

About the site and the monuments

Brown and White Caterthun are two prehistoric hillforts built upon neighbouring hills on the periphery of the Grampian mountains near the town of Brechin in Angus, Scotland. Each of the hillforts is made up of multiple enclosures built mostly of earth and wooden palisades. In addition, the remains of a large stone wall and surrounding rock-cut ditch are found at White Caterthun.

While the precise chronology of the two sites and how they relate to each other is unknown it is thought that a large part of their construction occurred during the early Iron Age, around two thousand years ago. Their usage is the subject of debate and may have included a range of domestic, military and ceremonial purposes.

Visualising the Caterthuns Questionnaire - Part 1 of 2

You have been provided with five examples of still images that visualise the Caterthun hillforts near Brechin in Angus, Scotland. The first two questions are about whether or not you already know about the site and its archaeological context.

Were you already familiar with the location of White Caterthun hillfort?

[ ] not at all familiar [ ] not very familiar [ ] slightly familiar [ ] quite familiar [ ] very familiar

Optional comments:

Were you already familiar with the archaeological interpretation of White Caterthun hillfort?

[ ] not at all familiar [ ] not very familiar [ ] slightly familiar [ ] quite familiar [ ] very familiar

Optional comments:

The following questions relate to your impression of the five example images. For each question please number the examples in descending order of preference, with 1 being the most successful / likely example and 5 being the least successful / likely.

Place the examples in order of how successfully they give a sense of the archaeological features of the site?

Please number the examples from 1 to 5 (1 means most successful): A[ ] B[ ] C[ ] D[ ] E[ ]
Optional comments:

Place the examples in order of how successfully they give a sense of how the site relates to the surrounding landscape?

Please number the examples from 1 to 5 (1 means most successful): A[ ] B[ ] C[ ] D[ ] E[ ]
Optional comments:

Place the examples in order of how successfully they give a sense of the three dimensional space of the site?

Please number the examples from 1 to 5 (1 means most successful): A[ ] B[ ] C[ ] D[ ] E[ ]
Optional comments:

Place the examples in order of how successfully they give a sense of the mood and atmosphere which might be felt at the site?

Please number the examples from 1 to 5 (1 means most successful): A[ ] B[ ] C[ ] D[ ] E[ ]
Optional comments:

Place the examples in order of how likely they would be to encourage you to visit / return to the site?

Please number the examples from 1 to 5 (1 means most likely): A[ ] B[ ] C[ ] D[ ] E[ ]
Optional comments:

Visualising the Caterthuns Questionnaire - Part 2 of 2

Next you are invited to watch the short (four minute duration) computer animated film "The Caterthuns". In the following questions you are asked to consider the impact of the film in reference to the five image examples.

Did the film add to your sense of the archaeological features of the site?

[ ] strongly disagree [ ] disagree [ ] neither agree nor disagree [ ] agree [ ] strongly agree

Optional comments:

Did the film add to your sense of how the site relates to the surrounding landscape?

[ ] strongly disagree [ ] disagree [ ] neither agree nor disagree [ ] agree [ ] strongly agree

Optional comments:

Did the film add to your sense of the three dimensional space of the site?

[ ] strongly disagree [ ] disagree [ ] neither agree nor disagree [ ] agree [ ] strongly agree

Optional comments:

Did the film add to your sense of the mood and atmosphere which might be felt at the site?

[ ] strongly disagree [ ] disagree [ ] neither agree nor disagree [ ] agree [ ] strongly agree

Optional comments:

Would watching the film be likely to encourage you to visit / return to the site?

[ ] strongly disagree [ ] disagree [ ] neither agree nor disagree [ ] agree [ ] strongly agree

Optional comments:

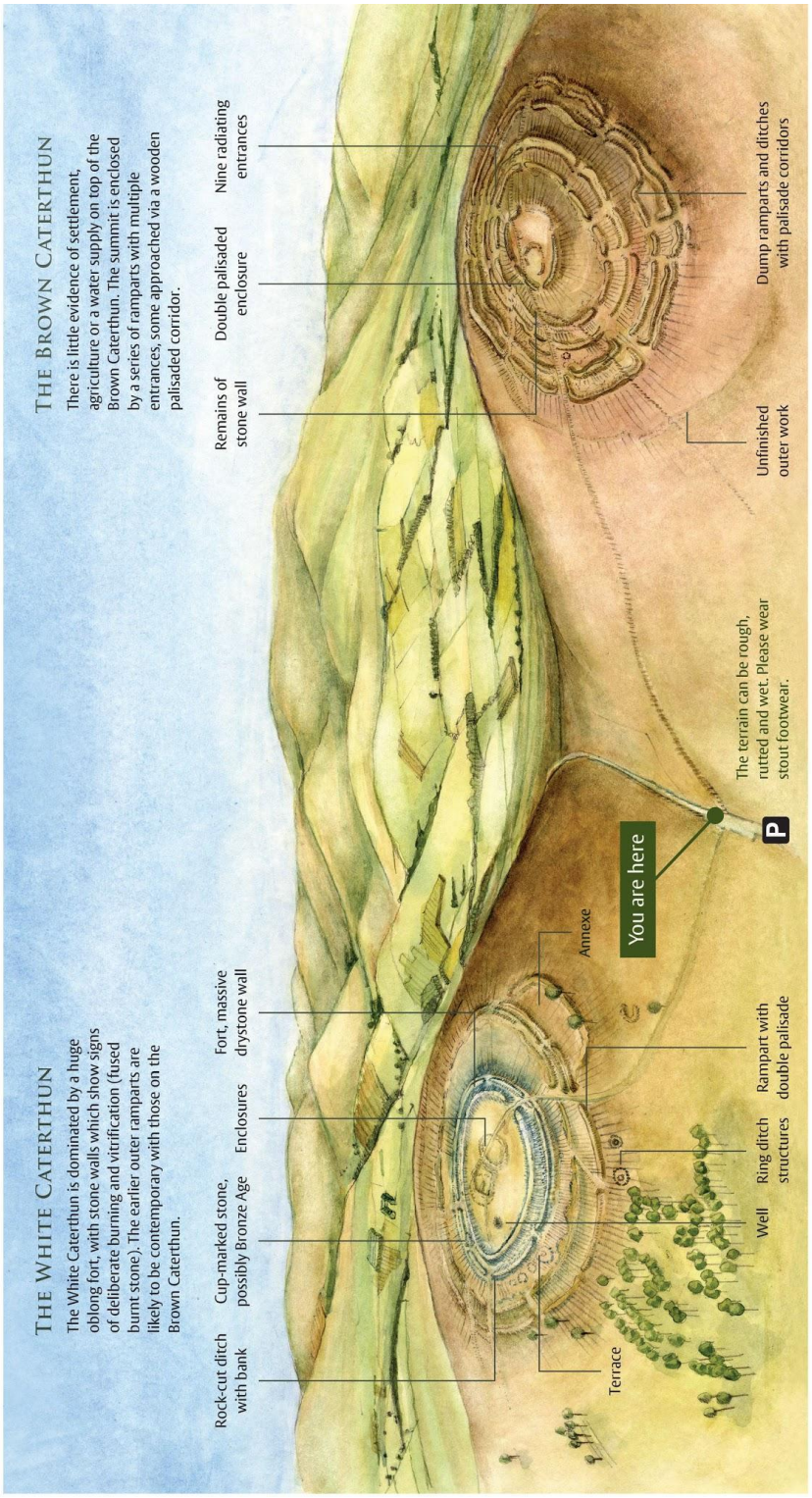
If you wish to leave any additional comments about the film , the example images or this questionnaire please do so here:

Many thanks for your participation in this study.

Kieran Baxter, PhD candidate
Duncan of Jordanstone Collage of Art and Design, University of Dundee
k.a.baxter@dundee.ac.uk

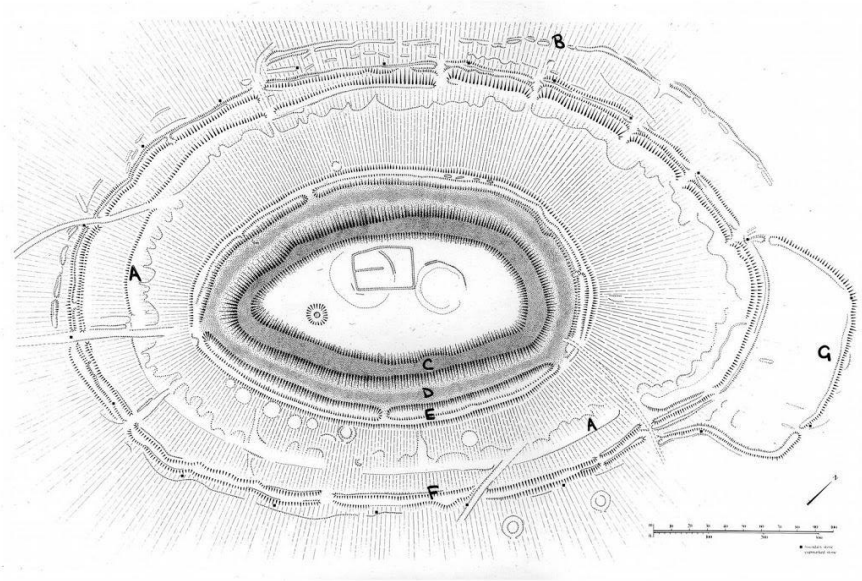
Appendix C - Visualising the Caterthuns example images

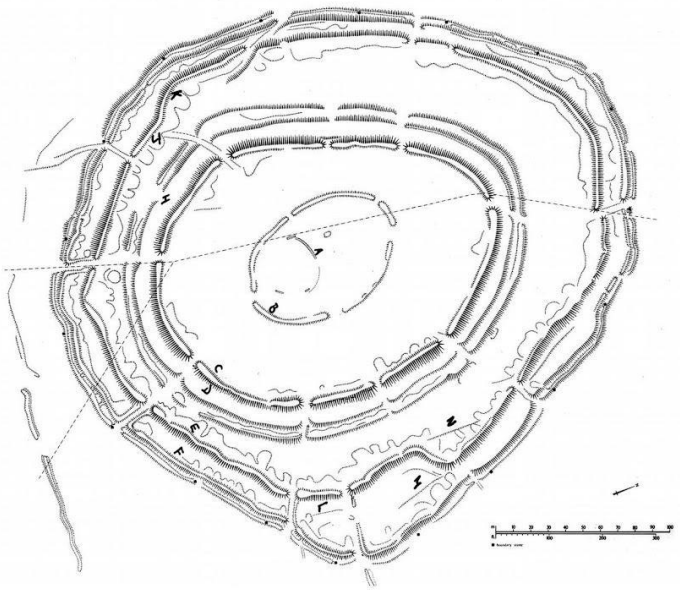
Example A



Extract from on-site interpretation panel.

Example B



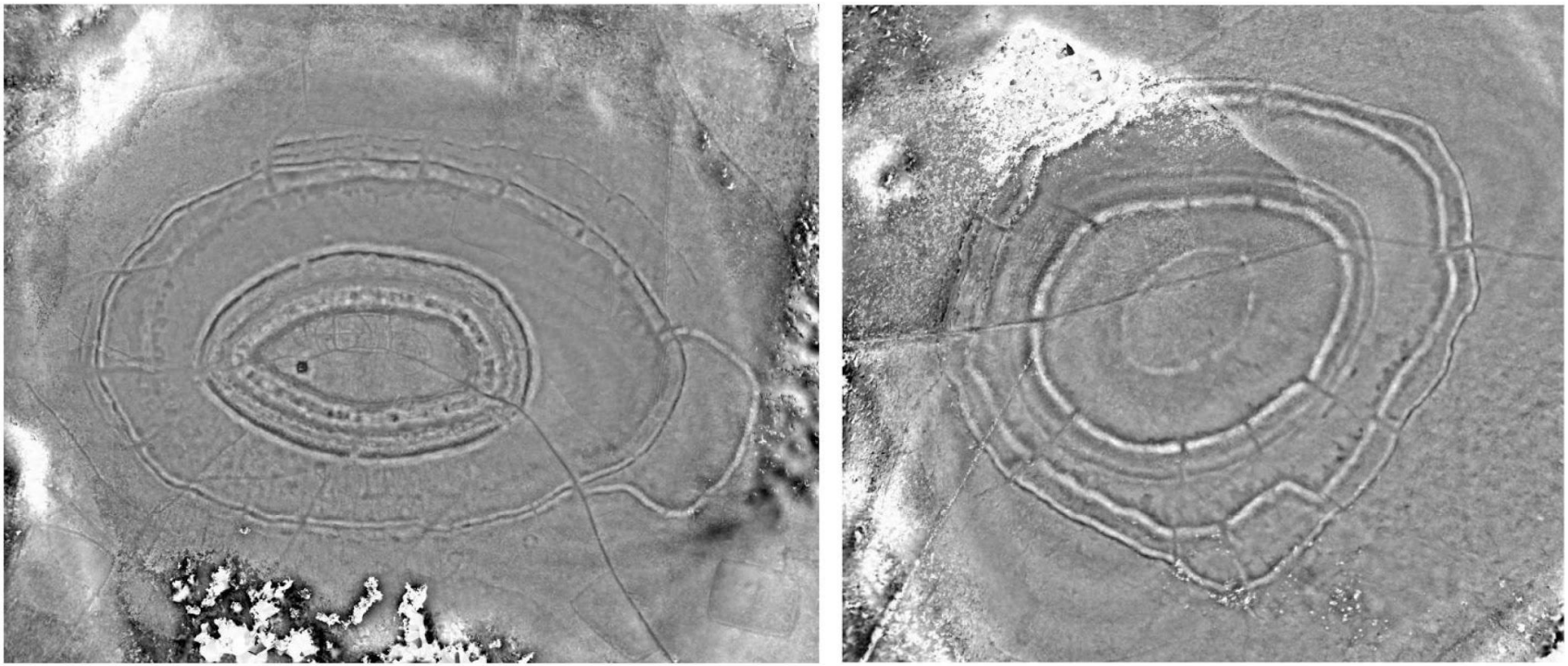


Archaeological site plans.

Example C

Orthographic aerial photography.

Example D



Elevation deviation maps.

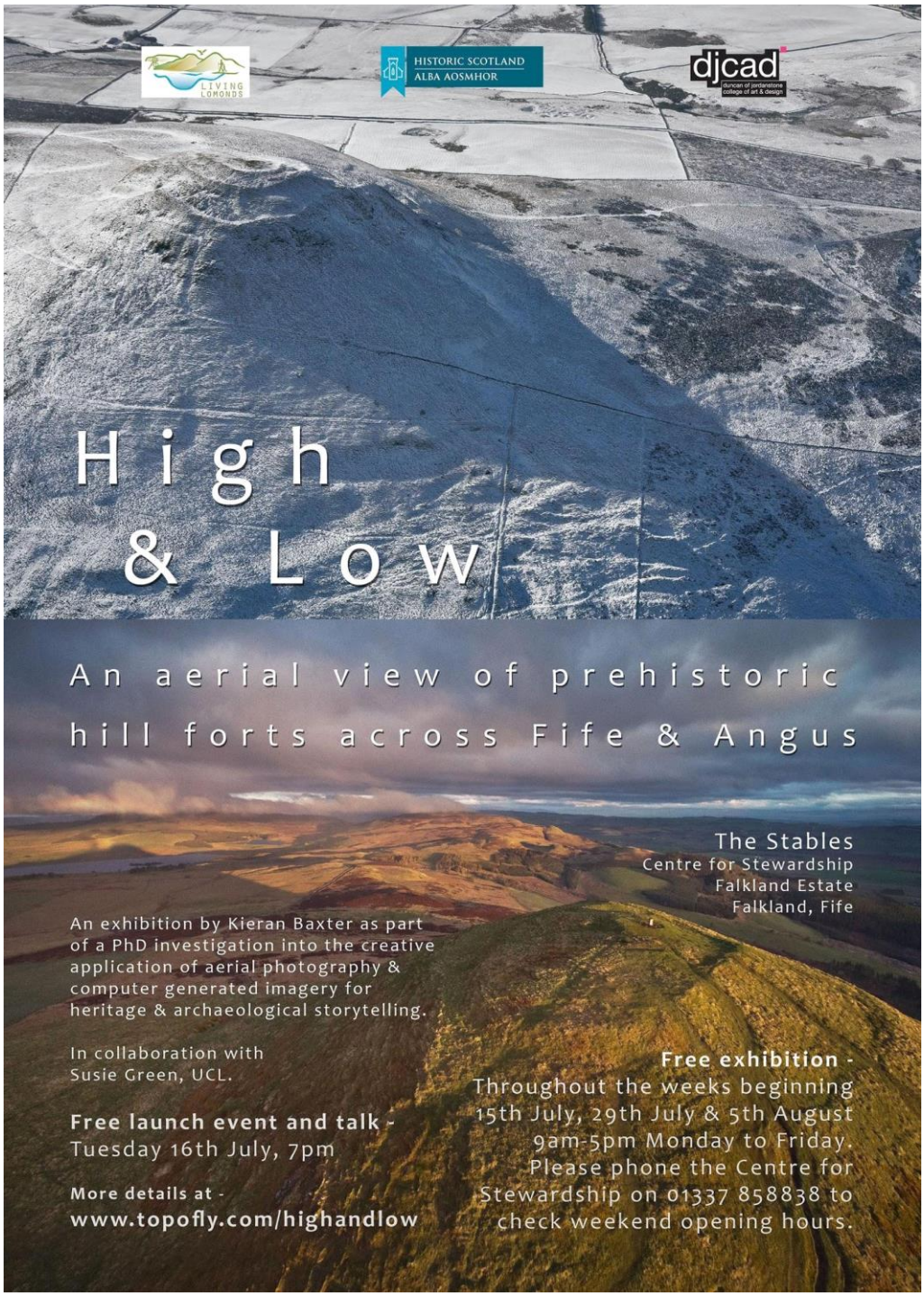
Example E

Oblique aerial photographs.

Appendix D - TAG-On-Sea 2013 Conference poster

Appendix E - Aerial photography exhibition posters

***High & Low* exhibition of aerial photographs, Falkland Centre for Stewardship, 2013**



***Above the Tay* exhibition of aerial photographs, Discovery Point, Dundee, 2016**