The Perception of Reality - Looking at Looking

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ABSTRACT

Much of our understanding of the world comes from looking at the things which surround us. Holography is the first technique, since the invention of linear perspective during the Renaissance, to offer a fundamentally different method of recording and displaying space and the objects within it. If holography reproduces the light which originally came from an object, what is it that we see when we look at the hologram? Does this 'possible illusion' have a place in museum culture?

This paper explores key historical milestones in cultural holographic imaging, the paradox of looking at, and interpreting, objects which are not actually there and the creative potential, explored by artists, using objects or the space where they once were.

INTRODUCTION

As a teenager I visited the British Museum, for the first time, with an enthusiasm for ancient Egyptian culture. I made my way to the Egyptian rooms and stood, slightly in awe, of those massive stone artefacts. They raised pubescent questions, not only concerning the cultural implications of the objects displayed, but ones of a practical nature: Why were they in London and not in Egypt? How were they transported here? Why did they not crash through the floor to the basement? What did they feel like?

In a purely innocent action, and to begin answering the last of these questions, I reached out to touch the base of one of the carvings and, from the other end of the gallery, boomed an attentive guard, "DON'T TOUCH THE EXHIBITS!!"

Apart from suddenly feeling like a vandal, caught in the act, and very conspicuous, I was fascinated by the idea that I could, in some way, damage one of these gargantuan objects which had survived centuries of 'touching'.

Today, years later, my blood pressure still increases when I visit the British Museum and walk into the Egyptian Room! I learnt, at a formative period, that museums were about 'looking' and certainly not about 'touching'.

ACCESSIBILITY – TOUCHING WITH OUR EYES

Museum curators and archivists have, over the past decades, made huge strides towards greater accessibility. There are some exceptional displays in institutions around the world, which have addressed the problem of accessibility and the balance required between allowing the public closer access to their collections and protecting those objects from damage, for the enlightenment of future generations.

Museum collections have become more approachable, more informative and more understanding of the requirements of their visiting public. However, the problem remains that a high percentage of objects in museum collections are fragile, priceless, or both. The act of preservation precludes physical contact by millions of visitors. We are required, therefore, to 'touch' with our eyes, to explore visually and, in effect, to build a three-dimensional model in our heads, then use this as our point of reference.

REAL-TIME VISUAL EDITING

This 'point of reference' is an important element in our navigation (and sometimes understanding) of the world around us. Even if we have no formal understanding of linear perspective, three-dimensional modelling and virtual visualisation, we all use these every day, and use them effectively.

Take, for example, the simple process of viewing an exhibition of paintings. As we walk into the gallery, we bring with us a number of preconceptions (often slight), which modulate how we interact with the exhibit both physically and psychologically.

Firstly, we know that the objects in the room we are about to walk into have some relevance and have been chosen by someone for a specific reason. There is an 'expert' curatorial basis for what we are about to see. We may not agree with the curatorial framework, might not know what it is (or want to know), but it is very clear that one exists. Someone has been asked to select something and show it to us. Immediately there is a subliminal knowledge that someone knows more about what we are about to see, or has a greater interest in it, than we do. Care will have been taken to make sure the display is as effective as possible and to convey the curatorial stance.

Secondly, we bring with us a basic understanding about what paintings are, how they appear and how they are displayed. Generally, they are rectangular, have a flat surface and hang on a wall[2]. We know what to expect, physically, when we walk into the exhibition. It is at this point that we begin our three-dimensional, internal, modelling. It is rare to approach a set of paintings head-on, seeing the rectangle as a rectangle. More often we approach a piece of work obliquely, actually seeing a rhomboid. We understand enough about how our visual and physical world works to know

that the painting is not an elongated trapezium, but a distorted rectangle. It is easy for us to rebuild the image we see, in our mind's eye, correct the distortion and know (approximately), how the image will appear when we are standing directly in front of it. In effect we remodel the visual world we see. Each step towards the painting changes the distortion and each time we resample, and rebuild, our mind's eye model.

If we view illustrations of the exhibition in a publication, we know that a different visual 'vocabulary' is being used. Photographs of paintings are taken 'head-on' and the optical distortions of the camera lens are often corrected so that we can view a perfect rectangle. Any views of the paintings, where they are viewed obliquely, tend to be establishing or installation shots to give us a feeling for how the various elements in the exhibition relate to each other in the space. They do not even need to be labelled as "gallery views" – we know inherently.

THE UNKNOWN VISUAL

With holograms, we are still developing our visual understanding of them as visual 'objects' because they do not appear to conform to our learnt expectations.

We know that images on flat surfaces are flat. Any three-dimensional appearance is a visual trick of linear perspective. However, the flat surface of holograms displays a three-dimensional image without perspective illusion and this 'counter indicator' can cause confusion.

We know that 3-D objects are visually stable and when we move round them we will see other (connected) views. Holograms can show multiple 3-D views with no reference to physical reality. A holographic image of an ancient artefact can, from a different viewing angle, display, not the side of the artefact but something completely different.

Photographs display objects 'frozen' in time. Holograms display objects 'frozen' in volume.

Sixty years since the invention of holography we are still trying to readjust our visual understanding of holographic display. It is not easy. So, if we have difficulty understanding what we are looking at in a hologram, is this a good medium to incorporate into museum culture? A look at what exhibitions currently do to display their collections can act as an introduction to this question.

OBJECT ISOLATION

Two obvious options for museums, or any collection visited by the public, are protection or documentation. In the first, we isolate the viewing public from the object, either by placing enough air between them, so that no contact can be made, or provide protection behind glass.

In the second, we remove the object completely and replace it with a replica. This might be a three-dimensional cast or, more often, a photograph. In all of these solutions, we are required to keep our distance physically or temporally.

Placing an object far enough away from the visitor, so that they cannot touch it, can be successful when objects are contextualised within a reproduction room or setting. These might suggest the possible usage and placement of the objects in a previous/historical 'real life' environment. Protecting the object becomes 'transparent' here – part of the display.

Isolation behind glass has become a successful 'staple', allowing us visual access with high levels of physical protection.

Replacement provides us with a 'memory' of the object. In the case of a cast, we view the three-dimensional space where the object once was, now filled with a material good enough to produce a facsimile of the original.

Photography offers us an accurate, graphic, reproduction – a recording of the brightness of light reflected from the object and its surroundings. We sublimely 'understand' photographs and, it appears, can successfully interpret their content in this archival situation. We know this is an image of an object. We do not try to look at the reverse of the photo to see the back of the object it contains.

All of the above examples request our direct visual involvement while protecting the objects we look at, either by distancing us from them in space or, in the case of casts and photographs, time as well.

A third option is the use of digital information storage to reproduce objects in a way which allows independent access, and manipulation, but which protects the object. The recent launch, by the British Library, of their "Turning the Page" project[3], allows visitors to their website to 'flip through' some of their most precious books online. Not only is the original book kept safe, but hundreds of people can view the same book at the same time, each selecting the pages they want to explore and, because of the amount of data stored, magnify sections of pages, listen to the book being read or access background information. These virtual books add a new dimension to protecting collections and allowing global access.

A more localised solution was launched in the summer of 2008 at the Virtual Museum of Archaeology (MAV)[4]. Here, all of the physical exhibits have been

replaced with virtual interactive displays, using projected computer graphics. The aim is to digitally reconstruct the town of Herculaneum, Italy, which was destroyed in 79 AD during the eruption of Mount Vesuvius.

Using an enormous collection of stored digital data, the museum offers a reconstructed, immersive, environment, which appears engaging as well as educational. A great deal of technology is needed to generate this large virtual world but, as Gaetano Capasso, concept developer for MAV, comments: "Technology has to prompt curiosity, but remain discrete." An observation poignant to the use of display holography.

One of the clear advantages at MAV is security. As there are no physical artefacts on show, there are no alarms, no security guards and no signs saying “Do Not Touch”.

Located close to the remains of Herculaneum, the digital reconstructions in MAV offer an alternative to the archaeological remains, which, like many sites of this type, are being damaged by large numbers of visitors walking around them.[5]

Both of these examples use reconstructions to protect the original objects, and, in the case of MAV, offer views of things which are no longer there.

ENTER HOLOGRAPHY

Not surprisingly, holography (despite its noted visual drawbacks), offers us a remarkable opportunity in the area of display, reproduction and object storage, but comes with its own series of curious limitations.

The display properties of holography are well documented[6], not only in scientific and art publications, published over the past 60 years, but also by other delegates to this conference who work directly, on a day-to-day basis, with the medium.

What is most interesting, as we celebrate 60 years of holography in 2008[7], is still its promise and the opportunities it offers to pioneering scientists and artists working in the field.

VENUS

Shortly after my British Museum 'education', I came across what has since become an iconic image in the short history of holography.

The 1 x 1.5 m hologram of the Venus de Milo by Jean-Marc Fournier and Gilbert Tribillon[8], apart from being the largest hologram of its type at the time, also offered the most 'promise'. Recording a hologram of this world-famous sculpture provided something more than a demonstration of scientific principals - it displayed a glimpse into a possible future, one where all major cultural objects were recorded holographically and distributed to museums and exhibitions around the world.

Geography and politics would become irrelevant. People could 'pop' into their local museum and see, in perfect 3-D, the treasures located in collections on the other side of the world. No need to travel there, no need to negotiate cultural or political borders. Every museum could, theoretically, contain every object from every other museum and extend accessibility enormously.[9]

REAL LIGHT

The light emitted from the hologram of the 'Venus' was the actual light reflected from the original sculpture's surface. It WAS the light from the 'Venus', indistinguishable from the original. Any viewer looking into the hologram would SEE the original because all the details (phase and amplitude) of the original light was falling on their retina. If the hologram was reproducing all the details of the original object, surely an observer would be 'seeing' the original?

This, of course, is a romanticised view of the events which took place 33 years ago. However, romanticism has a place in an objective world, stimulating desire and creative solutions. Great solutions can be borne out of excessive hyperbole.

Although the 'Venus' hologram captured the imagination of a generation it was produced not to whet the appetite of museum curators (although it clearly did), but as a way of broadening the public view of holography and its possibilities. In 1975, holography was still under-appreciated outside of the scientific community. Popular articles about its possibilities had been published and these captured the imagination of the general public, but something more was needed.

The Venus De Milo is an iconic sculpture in its own right, so to make a hologram of something inherently three-dimensional, and known globally, was a stroke of promotional genius. Agfa-Gevaert coated the 1 x 1.5 m holographic plate for the recording, the largest area to be covered in

holographic emulsion at the time, and secrecy surrounded the plate in case the recording did not succeed[10].

What was eventually produced, although spectacular and now an important part of the development of holography was, in effect, a 'shadow' of the original. As Jean-Marc Fornier comments, "I spent 10 or 15 nights of my life with the Venus. I will never forget her beauty, and how frustrating it was to choose an angle of view, to reconstruct the image through a restricted window (you cannot turn the hologram around like you could turn the sculpture around), and, despite the joy of success (this was the very first hologram ever made in one single plate bigger than 50 x 60cm…), it was so frustrating to reconstruct the image with grainy laser light when the white light illumination of the real object had enlightened my dreams and my days and nights."[11]

Although the hologram reproduces reality in three dimensions it is clear, from the comments above, that there is more to capturing 'reality' than simply recording its photonic 'signature'. These things need to capture something more – perhaps the 'soul' of the object, before they can accurately 'stand in' for the original. This intangible 'extra' places holographic reproduction at a disadvantage but, that said, recordings like the Venus still have an engulfing fascination. Perhaps museum and exhibition visitors might never experience the object's acknowledged beauty in the holographic version, but they may be visually stimulated to look more closely and perhaps seek out the original. This possibly undermines one of the demonstrated 'possibilities' of this piece (that all museums could have the Venus de Milo at the same time), but perhaps the desire to seek out the original is what makes reproductions more interesting. The "grainy laser light" used to illuminate this piece might distract from the visual accuracy of the original 'Venus', but there do remain phenomenal opportunities in situations where the need to protect and display objects is a serious consideration.

CONTEMPORARY RELEVANCE

It is important to mention here that there are two significant factors relating to the 'originality' of this example.

Firstly, the hologram was not actually made of the original Venus De Milo sculpture but a copy, albeit a high quality and very expensive one[12] – which raises questions about visual authenticity. Most of us might not be able to distinguish a copy of the sculpture from its original, probably less so in the holographic version which is monochrome (due to the laser illumination) and because we are distracted by the visual cleverness of the process.

Secondly, it is thought that the original sculpture would have been decorated with a painted surface, giving it a very different 'look' from the version we see today, irrespective of the fact that it used to have arms! It seems that our contemporary view of the sculpture is already 'distanced' from the original. As

with all historical artefacts, we are looking at a 'shadow' from the past – an approximate cultural contextualisation.

BEAUTY

Capturing beauty is difficult in any medium. Most holographic portraits of people, for example, although fascinating, lack the extra element which makes the person 'human' and accessible, or repulsive, dependent on the aim of the person making the recording. Painters have succeeded in 'capturing' the character of their subjects in the same way that sculptures have used volume to display an 'essence', so perhaps holography needs to be considered, inside and outside museum culture, a viable visual form, not just a high fidelity method of reproduction.

DISPLAYING THE ESSENCE

Perhaps the success of holographic reproduction is not in its fidelity but its ability to display the invisible, or at least relocate the visible in a new place for it to be better observed?

While the scientific community has often concentrated its research on the phenomenon of 'object', the arts-based community has revelled in the intangible recording of what is not there or might have been overlooked. We can learn from both these approaches.

In 1970, pioneering artist Margaret Benyon produced the hologram 'Hot Air'[13], made just 'up the road' from this conference at the University of Loughborough. This laser transmission piece showed, in three dimensions, the space where her hand had been - negative, 3-D, space with all the 'solidity' of an actual object. Scientists had long known that trying to record an unstable object in a hologram (such as human flesh), would not work well.[14] And it is perhaps curious to consider that there are (or were) a number of 'failed' recordings of objects which were consigned to the waste bins of research facilities world-wide!

Artists are good at doing what they are not supposed to do and the fact that Benyon persevered with this recording means that we are able to view something which was not previously viewable. As Benyon points out: "The physicist tries to get an approximation close to reality, to eliminate properties of the medium that distort, whereas it could be exactly those properties that make it unique to the artist."[15]

Although the hand-shaped black hole in this hologram has little visual detail, it subjectively captures the essence of the hand which was once there and stimulates questions about the owner of the invisible flesh. As museums and cultural collections are charged with the preservation and 'illumination' of the

past, the ability to 'capture the essence' of pieces in their collection could be paramount. Not necessarily by trying to reproduce objects holographically, but by employing holography to produce supportive illustration or cultural contextualisation.

One other example of holography displaying the absence of an object is Rick Silberman's 'Meeting'. Produced in 1979, this reflection hologram[16] displays the three-dimensional shadow of a wine glass which protrudes from the holographic plate into the space between the observer and the hologram. On a small shelf attached to the front of the hologram sits the wine glass, originally used in the recording of the shadow, which has been partially broken.
The hologram 'mends' the glass, making it whole again, as the shadow completes, in three dimensions, the 'lost' section of the object. A poetic and conceptual 'conclusion' of paramount significance.

Both of these holograms of shadows work not only because of their elegant simplicity but also because they show us something beyond the 'object', something which is intangible and untouchable – the roots of an idea or conceptual improbability.

There are numerous examples of artists who have captured shadows using holography over the past years and each adds to our visual questioning of what we 'see' around us. These are worlds apart from the hologram of the Venus de Milo. The 'Venus' is a technical gargantuan in the medium, physically and historically. Benyon and Silberman's pieces are physically small but conceptually large, possibly capturing the 'beauty' of the objects they were recording, which Jean-Marc Fournier identified as being so difficult to achieve.

REFLECTIVE IMPLICATION – THE SHINY SURFACE

Two of the attractive attributes of holography are their physical surface and the way they are displayed. A spot of light shining onto (or through) the shiny holographic plate provides a luminous 'focus'; a pool of visual brightness which draws the observer closer to the attractive 'shiny thing' on display. In a display context this can be an advantage, offering a way of 'punctuating' the display space and offering a sense of 'theatre'. This is not the prerogative of the holographer; artists working with more 'traditional' media have embraced targeted lighting in combination with reflective surfaces.

Painter Terry Shave uses an acrylic, resin, 'glaze' over the surface of his paintings and photographs which, in his exhibition at the Bonington Gallery[17], were displayed in a similar fashion to reflection holograms, each with a light shining from above onto the work's flat surface. This lighting was carefully controlled, using barn doors, so that only the surface of each painting was illuminated. The result is an exceptional feeling of three-dimensions, each of

the paintings suggesting a visual depth reminiscent of that displayed in holograms, here without the reliance on lasers or graphic perspective. “The work glowed and many visitors thought the painted and resined panels were light boxes! “[18]. Using light in this way frees the content of the work from the surfaces they are fixed to. I mention this here because too often we become fixated on a medium or process and it is often useful to explore visual and practical processes outside our main area of expertise. In this case, Shave’s work provides an abstract depth which is at least as ‘real’ as that produced by the holographic ‘illusion’.

REVISITING THE 80’S

Holograms and their characteristics have begun to pass into the global consciousness. We know what they are, we know what they do and we bump into them often, not only physically but also culturally. Films include them (as actual props or through post-production visual effects)[19] or they are embedded as passing references in popular literature: “He’d seen her only on one occasion and not for long, yet in his mind’s eye, she was as vivid as a fine photograph, a hologram.”[20] So there is an inherent (if inaccurate) understanding of what a hologram is, or might be.

During the 1970’s and 80’s, exhibitions of holography wowed their audiences in museum, gallery and commercial venues around the world. Many of these were a strange collection of display, scientific, industrial and sometimes fine art pieces. As Matthias Lauk explains at this conference: “The problem is that holography had, from the beginning, an ambivalent image presented on the one hand as new recording technique and as such a fascinating medium, and on the other hand a new form of art”.[21]

So, fascinated and confused, we, as observers, stumble through the display ‘landscape’, not quite sure what to make of all this and, not surprisingly, neither can museum curators. As an ‘industry’, we have sent out counter indicators and today this is still the case.

The current exhibition tour, ‘Holograms, the First 60 Years’, devised by Jonathan Ross in association with curators from Banbury Museum and the Oxfordshire County Museum, UK, continues to draw attentive visitors[22] and, unlike many of the early ‘mega’ exhibitions, is being shown in cultural venues (museums) with no charge for entry[23]. Visiting this exhibition is a little like going back in time. The ‘wow’ factor is still there, there are excellent examples of creative work from the Ross collection, but there are also commercial and promotional pieces, isolated but interspersed with the art. A survey show from the onset (as reflected in the choice of exhibition title), this introduces a new audience to the medium, most of them too young to have visited the shows of the 1970’s and 80’s. Expectations are high within this new audience, familiar with virtual worlds through their game consoles, Internet and ever improving three-dimensional, real-time, graphic

environments. Surprisingly, they still actually 'gasp' when they see holograms.

So, with the current interest in the medium, here in the UK at least, perhaps it is an opportune moment to consider its possible usage in museums, either as an enhancement to the display of work in the collections (through signage or background information), or as a way of displaying some of the more delicate objects which would not survive prolonged exposure to the public.

Animation, large scale, full colour and the flexibility of installation within a fixed environment offers the modern museum, and its curators, phenomenal opportunities for creative display. Perhaps the majority of these will not be simply three-dimensional, high fidelity reproductions of fragile objects, but inspired creative displays where holography is an important element in 'telling the story' and making the past more accessible. We have the possibility, through research into haptic holography (the ability to receive physical feedback when 'touching' a virtual object)[24] for us to actually be encouraged to touch the exhibits.

Perhaps fewer curious teenagers will be traumatised.

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FOOTNOTES

[1] Contact: mail@apepper.com, www.apepper.com
[2] Clearly not all paintings conform (or should conform) to these parameters but generalisations are made here for clarity.
[3] Turning the Pages can be viewed on a PC or Mac at http://www.bl.uk/onlinegallery/ttp/ttpbooks.html. Turning the Pages 2 is an advanced version viewable using Microsoft Vista operating systems (and on Windows XP with the .NET 3 framework). It will also run on other operating systems using the Microsoft Silverlight plugin.
[4] www.museomav.com/mav/internet/home A news report and video can be located at http://news.bbc.co.uk/1/hi/programmes/click_online/7610956.stm
[5] The Italian government recently cut its cultural budget by 1.3 billion Euros, meaning there is less funding for the repair and preservation of their historical artefacts and sites. MAV not only generates an income, but also reduces the number of visitors who could potentially damage the actual site.
[6] Benton, S.A., Holography: The Second Decade, Optics News, Summer 1977.
[7] Dennis Gabor, A New Microscopic Principle, Nature, 161, pp 777-8. 1948.
[8] Jean-Marc Fournier and Gilbert Tribillon, Laboratoire d'Optique de Besançon, France, (LOBE), 1975.
[9] Holographically recorded treasures, from Russian museums, have been successfully displayed in non-museum venues, allowing fragile and valuable items to be transported across borders and viewed by exhibition visitors who might not normally have the opportunity. A commercial example of this was the "Treasures of the USSR" exhibition, held at the Trocadero, London, UK, during 1985. Holography: Treasures of the USSR, (Pepper, Andrew, editor), Exhibition catalogue, Light Fantastic, London, UK, July 1985.
[10] Details provided by Jean-Marc Fournier in correspondence with the author, July 2008.
[11] See above (3)
[12] Details provided by Jean-Marc Fournier in correspondence with the author, August 2008
[13] A year previously Benyon produced 'Metal and Hand' also displaying the space where her hand had been located.
[14] During the late 1960 and early 1970 holograms were generally recorded using accessible continuous wave lasers which precluded even the slightest amount of movement in an object being recorded. Blood passing through live skin would be enough to prohibit a bright recording.
[15] Benyon, Margaret, How is Holography Art?, PhD Thesis in Holography, Royal College of Art, London, UK, April 1994, p36.
[16] Produced as an edition of 24, this piece is now located in many major museum and art collections world-wide.
[17] 'Closer than you think' Bonington Gallery, the Nottingham Trent University, Nottingham, UK. Inaugural professorial exhibition, April 2008.
[18] Terry Shave commenting on the installation of his exhibition, www.terryshave.blogspot.com
[19] Pizzanelli, David, Hollywood's Holograms, Royal Photographic Society Holography website: www.holography.co.uk/RPS/hollywood/hollywood.html
[20] The Darkest Evening of the Year, Dean Koontz, p 72, Harper Collins, UK, 2008.
[21] Lauk, Matthias, abstract, Holography in the Modern Museum, DeMontfort University, UK.
[22] During 2008 the exhibition toured to: Banbury Museum, Oxfordshire, UK, The Oxfordshire Museum, Woodstock, Oxfordshire, UK., Rugby Art Gallery and Museum, Rugby, UK., and Buckinghamshire County Museum, Aylesbury, UK.
[23] Many of the very popular holography exhibitions which drew a great deal of press attention, charged an entry fee and included a shop for the purchase of commercial merchandise.
[24] Plesniak, Wendy J, Haptic holography : an early computational plastic, Ph.D. thesis, Massachusetts Institute of Technology, USA, School of Architecture and Planning, Program in Media Arts and Sciences, 2001.