Natalie Edwards

0306743A

MA Digital Arts

Wits School of Digital Arts:

University of the Witwatersrand

Theory Supervision: Tegan Bristow

Technical Supervision: Mileta Postic

Title:

Negotiating Virtual Spaces: Exploring the collision of Real and Digital Space in Human Perception

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1. Introduction

In a global environment where communication, socialization and entertainment are increasingly defined by digital media technologies, the boundaries that delineate perceptions of what is 'real' from what is 'virtual' are being critically disputed. In relation to digital media, one of the challenges that typical human perception is currently faced with, stems from the intrinsic human need to map the digital space according to a set of 'reality' mapping coordinates. New media art explores the way in which the two seemingly incongruous languages of the 'real' and the 'virtual' can be manipulated to affect a shift in human perception from the 'ocularcentric' (Lenoir xxii) to the embodied. Cultural theory, as well as theories relating to cognitive processes and perception are being revised and reinvented by authors such as Lyle Massey, Kim Veltman and Mark Hansen, in an attempt to understand our relationship with technology. In a world where seeing is no longer believing, the tools by which we typically identify reality are rendered obsolete and with them, the boundary that separates the virtual, digital world from the real, tangible one.

My work looks at the ways in which we perceive digital spaces whose co-ordinates waver between a state of constant flux and momentary stability in relation to the our physical proximity to the digital space. Using Rennaissance trompe l'oeil techniques and digital projections of virtual space, I explore the role that specific pieces of new media art have in affirming the form-giving potential of the human participant, by coaxing them into performance. I look at the work of contemporary new media artists William Kentridge, Robert Lazzarini and Pablo Valbuena, in my investigation of the

human conception of the digital space. I look at simulacra, artifice, and the gaze as components of digital illusions that give rise to a performative comprehension of corporeal and virtual space. Ultimately I will show that the only means by which we distinguish the real from the virtual is through embodied, haptic human perception that arises out of human performance around the digital.

2. The Cartesian Question and the Evolution of Anamorphosis

It was in the early 1600's that French mathematician Rene Descartes first penned his theory on the rational, scientific representation of objects in space. Combining Euclidean geometry and algebra, his theory was based on the premise that any object could be plotted in space using three, fixed, mutually perpendicular planes. The Cartesian plane could be used to construct an ideal, disembodied, decentered viewpoint which the artist or viewer is asked to inhabit. Usually associated with linear perspective, this viewpoint was seen as being synonymous with what Descartes termed the "mind's eye". The viewpoint was intended to approximate the realities of optical vision, thus creating realistic illusions of depth on flat picture planes through the diminutive treatment of geometry relative to a fixed viewpoint. It has, however, been argued that "[…] the realities of pictorial composition are [far] more complex…" in that, even in the construction of single point perspective, the number of possible viewpoints from which to view the image plane are vast and each independent viewpoint has optical legitimacy. (Veltman 2)

Looking at the history of perspective as a term used to describe the geometric representation of depth on a two dimensional surface, this chapter will focus on how anamorphosis and other geometric projection techniques evolved parallel to the implementation of linear perspective as the dominant means of depth representation. Further, I will discuss how the use of such apparently obscure geometric projections affect the physical and theoretical reception of the image and how this is in turn affected by its adaptation to the digital.

With specific reference to Kim Veltman's text *Perspective, Anamorphosis and Vision* (1986) I will give a brief outline of the historical trajectory of perspective from its roots in Euclidean optical theory and Renaissance surveying practices, to its consequent manifestations in contemporary theory and the practical applications thereof. I will show that Anamorphosis evolved alongside linear perspective and had legitimate practical applications that served a variety of purposes. Lyle Massey's *Picturing Space, Displacing Bodies* will provide further insight into the theoretical atmosphere of the 'invention' or discovery of perspectival representation techniques from antiquity to the Renaissance and beyond. I will show that the application of the digital to anamorphic representation gives the notions of perspective and the mind's eye new significance with specific reference to Mark Hansen's *New Philosophy for New Media.*

3. Perspective Representation from Antiquity to the Renaissance

According to Kim Veltman in her *Perspective, Anamorphosis and Vision;* In 4th Century Greece, centuries before Brunelesci is said to have 'discovered' linear perspective, artists of Antiquity were creating images with the illusion of depth constructed through a number of empirical methods. Based on observation and optical experimentation, artists had discovered that images warped the further away from the eye they were, in accordance with the viewing angle. (Veltman 12) When one views an image painted on a wall higher up toward the ceiling, the image appears smaller and more squat than it would if viewed from a directly frontal angle. To compensate for this, artists used optical adjustments techniques, which elongated and warped the image so that from the ground it appeared correctly proportional. Canvases and two-dimensional images depicting landscapes consisting of more than one field of depth, were treated with the optical adjustments theory inversely, in a manner that, to the contemporary viewer, seems incongruent and jolting. Although on the same depth plane, figures that, according to linear perspective, would appear the same size, are made two different sizes in order to allude to the fact that one is higher up in space than the other.

Another method for the creation of illusionistic depth used in antiquity was, what art historian Erwin Panofsky described as the "[…] fishbone-like alignment of vanishing points along a central axis" or axial perspective, which resulted in the bizarre juxtaposition of viewpoints that characterize much of the art of this time. (Panofsky in Veltman 19) According to Panofsky the last method, mostly evidenced in Pompeian images, is akin to linear perspective,

although not quite as geometrically eloquent as that developed during the Renaissance. (Panofsky in Veltman 19) These elements vied for dominance until the 15th Century when linear perspective was adopted as the method that most faithfully mimicked optical depth perception. However, as Veltman states, the optical adjustments methods used during antiquity remained the dominant solution to problems of warping and stretching of images in physical space, she argues that It is in this practice of compensating for the angular warping of geometry that the roots of Anamorphosis can be found. (Veltman 19)

Antonio Manetti, Brunellesci's biographer, recorded famous experiment with perspective in the 1480's and it is thanks to this text that Bruneleschi is said to have 'discovered' linear perspective. (Kubovy 2)[1] Using a painted panel representing the Florentine Baptistry as viewed frontally through which a hole was drilled the viewer/ participant was to hold the hole in the unpainted side of the panel up to their eye and, through the hole, view a mirror reflecting the painted surface. In its displacement of the object being viewed and the viewpoint itself, Brunellesci had discovered that when one posits the viewer directly in front of the canvas and constructs the trajectory of the vanishing point around that position, the image convincingly approximates optical depth perception. This experiment introduced a number of debates around different cultural theories of the laws of optics and linear perspective in the construction of images. Erwin Panofsky is of the opinion that there must be "necessary connections between the world view of a given culture, its theory of vision

[1] *http://www.webexhibits.org/arrowintheeye/brunelleschi1.html*

and its theory of projection and representation" suggesting that the constrained world views of antiquity lead to a theory of curvilinear representation based on optics. (Veltman 19) The idea, then, is that the atmosphere of scientific experimentation characteristic of the Renaissance provided a solid foundation for the discovery of both linear perspective, and of the many geometric distortions thereof. Similarly, Panofsky attributes the use of linear perspective and the experimentation with planar, geometric projections during the Renaissance to the enlightened worldview of the time. (Panofsky in Veltaman 18)

Kim Veltman refutes Panofsky's claims stating that the method of perspectival representation in any given image is independent of worldview and is evidenced in similarities in the experiments with geometric projection and optical theory carried out since antiquity. (Veltman 19) Looking at Renaissance images constructed around linear perspective, it is clear that the artists were aware that the image was going to be seen from various different angles, and while the optimal angle is head on and in line with the vanishing point, the images are constructed in a way that makes visual sense from positions off to the side. Indeed certain depth cues of these images are triggered more effectively from more acute angles. A distinct example of this, as pointed out by Veltman, is Piero della Francesca's *Brera Altarpiece* (Fig. 1) where the elongated oval-shaped egg hanging from the conch-shell like feature gains volume and weight when viewed from off to the side. This is evidence of the kind of compromise between linear and anamorphic perspective that renaissance artists were employing in the construction of

images that were intended for viewing by a number of people simultaneously. (Veltman 3)

Fig. 1. de la Francesca, Piero. *Brera Altarpeice*, Milan, Italy.

Linear perspective became the primary means of representing depth in two-dimensional images because of its ability to be viewed from many various viewpoints simultaneously. While anamorphic projection gained legitimacy in its many practical applications and in later experiments came to subvert the notion of the ideal subjective viewpoint constructed by linear perspective, by its dependency on a fixed viewpoint for its visual comprehension. It was Hans Holbein Jr. who was able to make the already established, albeit subtle,

confluence of linear and anamorphic perspective so pronounced that it questioned the illusionistic depth created by both techniques and re-asserted the physical two-dimensionality of the picture plane. (Massey 39)

Holbein's "the Ambassadors" (Fig. 2) painted in 1533 depicts two ambassadors posed in the manner of a conventional portrait. In the foreground, hovering above the floor, is the anamorphic, distorted image of a skull, most often taken to symbolize mortality. More than a mere exercise in virtuosity, what is so enthralling about this image, is that the viewer is asked to physically inhabit two different positions in relation to the picture plane, two different instances in the time continuum that perspectival depictions open up. The image foregrounds the fact that "…in its most orthodox employment, perspective demonstrates a fundamental, paradoxical contradiction between viewpoint and representational field..." giving credit to the notion of the parasitic viewpoint (Massey 5). Furthermore the image illustrates the physical, embodied reaction of the viewer to a visually foreign stimulus. It is no longer the ambassadors who are the subject of the painting, but the interaction between the viewer, the image plane and the illusionistic depth constructed by the two competing perspectives.

Fig. 2. Hans Holbein Jr. *The Ambassadors,* 1533

While Holbein was engaging with the complex paradoxes of the nature of representation and image consumption, the fashion for optically adjusted church chapel frescoes, that was born in the early 1400's, had gained momentum and by the 1600's artists such as Andrea Pozzo were exploiting their advanced understanding of *trompe l'oeil* to powerful effect in architectural frescoes. At the Jesuit church of Sant'Ignazio in Rome, Pozzo employed anamorphic distortion in the visual supplementing or even rectifying of the architectural flaws of the original structure. Pozzo's techniques Evolved from the use of optical adjustments techniques in church altar frescoes, where kneeling worshipers looking obliquely up at the elongated images, were

suddenly, through anamorphic projection, greeted in an immediate, ephemeral way by illusively lifelike images such as those at The Baroncelli Chapel in Santa Croce in Florence. (Fig. 3) Pozzo's frescoes at Sant'Ignazio include the Dome of the Church (Fig. 4), which is in fact not a dome at all, "…It is said that the neighbors of Sant'Ignazio didn't want a rather large dome blocking their sun," and therefore Pozzo was asked to create the illusion of one. (Furman)[2] The dome is a flat surface painted with the anamorphic projection of a ribbed dome. A marker on the floor of the church alerts the viewer to the optimal viewpoint at which the *trompe l'oeil* effect is satisfied. The nave's barrel vault (Fig. 5) is also painted with an anamorphic projection that has the effect of dissolving the vault into a bright open sky with religious figures ascending into it.

[2] http://www.aadip9.net/timeline/1626/10/sant-ignazio-di-loyola-a-campo.html

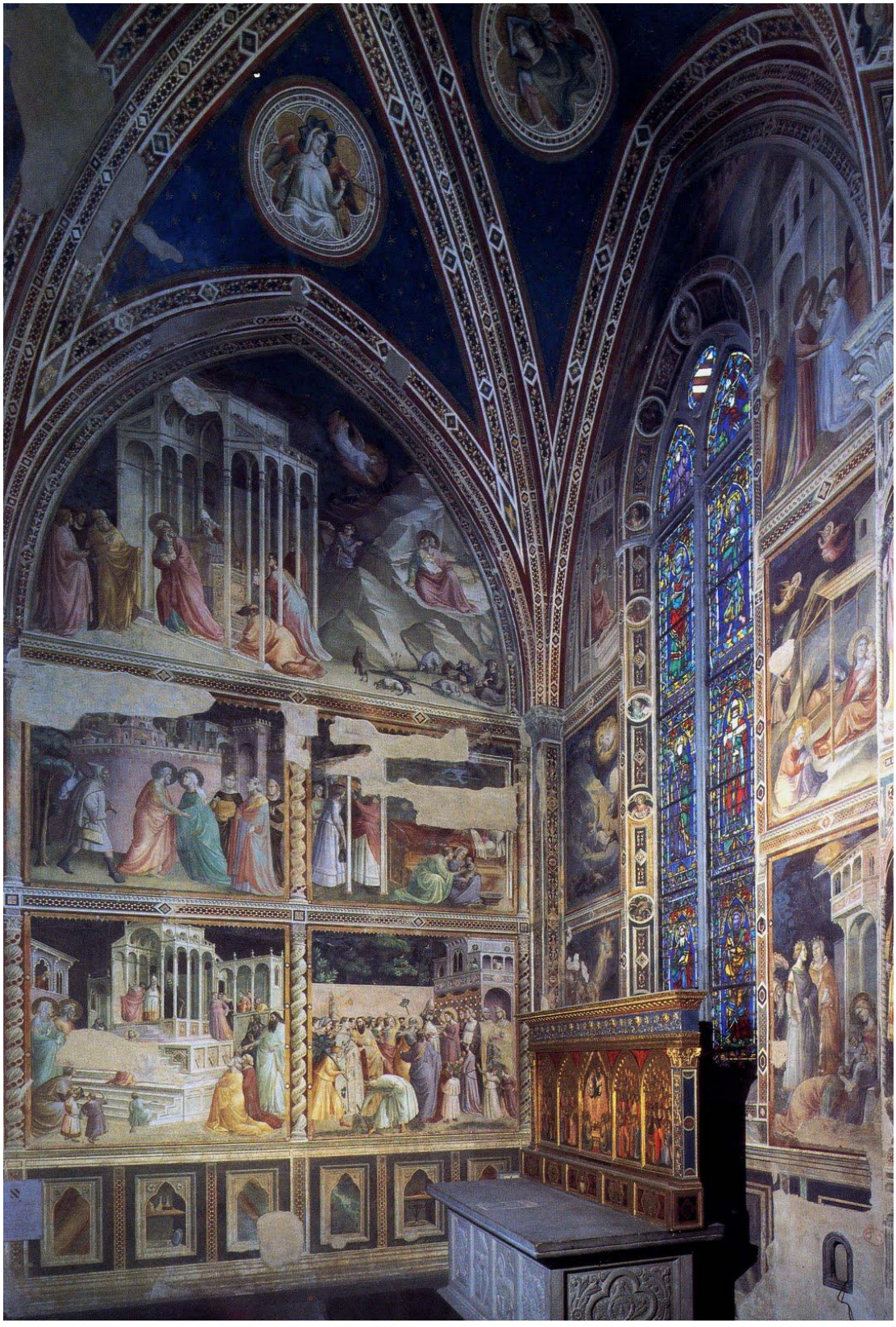

Fig. 3. Taddeo Gaddi, Life of the Virgin in the Baroncelli Chapel, Santa Croce, Florence, 1328

Fig. 4. Andrea Pozzo’s depiction of a dome at the church of Sant'Ignazio, 1684

Fig. 5. Andrea Pozzo’s fresco in the barrel vault at the church of Sant'Ignazio, 1684

Da Vinci had spent much energy from the 1480's to the early 1490's, experimenting with optics and geometric projection, plotting the kinds of anamorphic projections used by Pozzo in his dome and nave vault. da Vinci was exploring alternatives to linear perspective in two-dimensional representation and stated that these alternatives only come into question under extreme conditions and …[recommended]… that these extreme conditions be avoided in order that linear perspective… [could]… be used" (Veltman 17). Renaissance artists favored linear perspective because of its egalitarian nature and its close approximation with optical perception. (Massey 18)

Although Brunellesci's experiment is popularly seen as the revelatory moment in which artists of the Renaissance were enlightened to linear perspective, it was in fact a gradual process that had already long been set in motion. This was a process that, far from attempting to discover a standard means of constructing illusionistic depth cues, was more concerned with how geometry was projected through space and how the mechanics of vision and perception related to representations of that geometry. According to Veltman, Massey and other scholars, it was thanks to the practice of land surveying that much of this Renaissance theory around optics, vision and perspective was attained. (Veltman 15 and Massey 90)

According to Veltman In the late 1400's thinkers, artists and mathematicians such as Piero de la Francesca, Leonardo Da Vinci and

Albrecht Dürer, whose interest in surveying practices gave them insight into the nature of both linear perspective and geometric, cylindrical projection. (Veltman 15) In fact, the term 'perspective' was originally seen as synonymous with measurement and appears in Dürer's 1525 surveying treatise "Underwuysung der Messung" and in Da Vinci's 1508 writings on surveying (Veltman 15). Instruments invented for the accurate measurement and representation of landscapes in surveying were a key factor in the development of linear perspective and geometric projection, of the most notable were the proportional compass and Baldassare Lanci's drawing instrument. (Veltman 15) Accompanying the invention of such instruments were the theoretical writings and experiments of Danti, Da Vinci, Alberti, de Jode, del Monte, Burgi and Hulsius, who wrote extensively on the proportional diminution of visual angles with distance. The most obvious, visually apprehensible manifestation of these writings is the perfecting of linear perspective in two-dimensional representation, but, in Veltman's opinion, it was also the use of these instruments that provided insight into the nature of curvilinear geometric projection. (Veltman 17) Lanci's surveying instrument made use of a curved plane onto which measurements and geometry were recorded, the curvature of this plane was a response to Euclidean optical theory that requires the distortion of geometry to compensate for extreme visual angles. (Camerota)[3] The experiments done with geometric projection by da Vinci, Vaulezard and others found their roots in these early instruments.

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3 http://redi.imss.fi.it/inventions/index.php/Surveying_Instrument_by_Baldassarre_Lanci?PHPSESSID=11ir8pe83025qdakf52peqn1c7

Leonardo da Vinci's inquisitive nature prompted his first anamorphic sketches that explore the use of the Cartesian model in constructing fixed viewpoints in relation to warped images. The interest in optic, or linear, Anamorphosis can be seen in the writings of Renaissance artists and scientists such as Jean-Francois Niceron, Gaspar Schott, Leonardo da Vinci, and Athanasius Kircher, and its application can be seen in many architectural frescoes. (Veltman 17-21) This is, however, not where da Vinci and his contemporaries abandon their exploration of Anamorphosis and other *trompe l'oeil* techniques. In the early 16th Century Egnazio Danti publishes a device credited to da Vinci that involves the projection of an image onto triangular bars, which requires the use of a plane mirror to be resolved, also known as catoptric anamorphosis (Veltman 12). Mathematicians such as Vaulezard then adopted the science of anamorphic projection, challenging themselves to calculate these projections, the practical outcomes of which became fashionable in Parisian society in the early 17th Century. Devices such as the flat circular disk with conical mirror (Fig. 6) that made use of catoptric anamorphosis, were used for entertainment or as a means of disseminating information of a controversial, political or even pornographic nature.

Fig. 6. Istvan Orosz's *Anamorph with column 2,* 2007

Although its practical applications were far more widely recognized, Catoptric Anamorphosis carried less weight in the theoretical debates around perspective at the time than did optic Anamorphosis, perhaps explaining why it was relegated to fashion and largely ignored by artists and mathematicians after the renaissance. The effect is, however, much the same, both demonstrate a removal of perspective from the body, a reframing of the subject and viewer and both make that viewer acutely aware of their corporeal reality in relation to the two dimensional picture plane. And much like Brunelleschi's experiment, and even Holbein's *Ambassadors* it is Catoptric anamorphosis that reinserts the viewer into the picture plane, by visually collapsing "…the viewpoint onto the two-dimensional, pictorial surface […thereby forcing…] viewing distance […to…] disappear…" and the viewer becomes the physical manifestation of both the gaze and that subject being

gazed upon. (Massey 17) Ultimately, Massey argues, what is constructed is a visual representation of the gaze itself.

The premise of anamorphosis and other *trompe l'oeil* effects is the use of the rational, geometric tools of perspective in the creation of purposefully distorted images. The distorted image is then viewed either from a predetermined vantage point or via some visual apparatus. It is this reliance on the physical, corporeal spacing of the viewer to, and their interaction with, the picture plane that sparked theoretical debates about the legitimacy of the Cartesian construction of a viewpoint in accurately representing perspectival depth. Theorists as far back as William Wollaston and Raymond (early 1820's) were discussing the phenomenon of the shifting eyes of portraits relative to viewpoint. (Veltman 3) Interest in the subject intensified and figures such as Giuseppe Ovio, and psychologist Robert H. Thouless experimented with optics and visual representation. Today debates on the subject include certain key texts by scholars such as Erwin Panofsky, White, Maurice Pirenne, B.A.R. Carter , Ernst Gombrich and Nelson Goodman. (Veltman 3)

In a sense the use of *trompe l'oeil*, Anamorphosis and "[…] regular perspective in the seventeenth Century represented related approaches to the same issue: the problem of space and viewing position…" and how perspective is parasitic on the viewer. (Massey 21) A burning issue during the renaissance, when experiments with perspective, optics and vision were relatively novel, at least in any formally recorded sense, the idea of constructing perspective that imitates, even approximates optical perspective was what drove the manifestation of *trompe l'oeil* effects and devices.

Today these effects have been assimilated into many different aspects of contemporary society including new cultural and technological applications, the theoretical debates around which have been afforded little attention or significance until it comes to the arts. The practical applications of anamorphosis have grown wider in both the commercial and artistic sense. Optic anamorphosis, once a great feature of many churches and some other classical architecture has now been applied to street markings, advertising billboards in stadiums and sidewalk surfaces. The mathematical principals have been applied in the creation of High definition wide screen imaging technology and 'holographic technology'. But the debates around perspective, corporeal space and the parasitic viewpoint have gained new significance in the field of contemporary digital art. Contemporary artists are engaging with classical theories of corporeal and projected space in the new context of the virtual and digital technology. The implications of these kinds of updated interactions with classical theories play an essential role in our grasp of virtual space.

4. Finding Your Feet in the Virtual Realm

Contemporary artists like Robert Lazzarini are taking the mathematical, logic of Cartesian perspectivalism and overlaying it with the inhuman rhetoric of the digital so as to produce 'anti-anamorphic' images and objects that purposefully displace the typically fixed viewpoint of the anamorphic image with a transient, unattainable one. Instead of locating a fixed moment in the

perspectival time continuum, Lazzarini's sculptures simply demonstrate the infinite in their ability to affect a constant state of motion in the viewer, an eternally incomplete performance. Contemporary South African artist William Kentridge engages with classical perspective theory in another way, focusing less on the visual lexicon of the digital, he looks more at the transient nature of the projected, moving, anamorphic image and engages with the convoluted series of transpositions of image, viewer and viewpoint. These artist's works will be discussed further in my investigation of anamorphosis and the digital as elements that initiate physical movement, and will inform the discussion of my own creative process. Here I will embark on an investigation of the ways in which digital anamorphic projection departs from established, conventional uses of anamorphosis in terms of how a physical response to visual media is affected.

5. Digitally Mapping an Analogue World

The word most often used to describe the reaction one has to the sculpture-installations of Robert Lazzarini is "unsettling" and when looking at works such as *Skulls* (2000) (Fig. 7) and *Payphone* (2002) (Fig. 8) it is immediately obvious why. The sculptural objects that stand alone, as if abandoned, in Lazzarini's installation spaces, have been both visually and physically altered in a way that lends them a fluid dynamism, which permeates outward into their physical environment. Using real world objects as an index for his sculptures, Lazzarini applies typically 2 dimensional or linear distortions to mundane, everyday objects, in 3-dimensional space, warping them along the X, Y and Z-axes. The model, after being manipulated in 3D computer software, is then materialized from the original material of the

object being referenced, in an attempt to maintain a sense of fidelity to the original object. When installed in the exhibition space, careful attention is given to the lighting and general tone of the environment in the pursuit of a non-space, or as Gilles Deleuze termed it the "Any-Space-Whatever" (ASW) (Deleuze 113)[4]. The unattainable fluidity of the object that one is then presented with has emotional, psychological, and ultimately physical effects on the viewer in its disruption of our instinctual understanding of optic perception. Unlike the definite optimal viewpoint created by the 2-dimensional anamorphic image, Lazzarini's objects are affected by several different distortions along a number of axes projected into physical space, so that no singular optimal viewpoint can be defined. As the viewer is forced into motion in search of a viewpoint they begin to experience a sense of vertigo in relation, not only to the object, but also to their own physical reality. (Hansen 198) Lazzarini's words: "…the objects slip in relationship to the wall and […] the viewer slips in relationship to the object" (Lazzarini) [5] describe how the work ignites questions around notions of simulacra, phenomenology, the gaze and optic perception within the viewer.

[4] For Deleuze the ASW was a visually non-descript space created within the cinematic frame, a space that through lighting and framing was stripped of any discernable reference to an actual, real world space. (Deleuze 113)

[5] from http://fromthefloor.blogspot.com/2004/11/discussion-with-robert-lazzarini-part 03.html

Fig.7. Lazzarini, Robert. *Skulls*, 2000

Fig. 8. Lazzarini, Robert. *Payphone*, 2002

Mark Hansen engages with Lazzarini's sculptures and, referring back to Deleuze's Any-space-whatever, coins the term the "Digital any-space-whatever" to describe the kind of unsettling environment that these distorted sculptures create. (Hansen 207) To Deleuze, a film theorist, the Any-Space-Whatever is

> …not an abstract universal, in all times, in all places. It is a perfectly singular space, which has merely lost its homogeneity… so that the linkages can be made in an infinite number of ways. It is a space of virtual conjunction, grasped as pure locus of the possible (Deleuze 113).

It follows from this argument that the lack of external visual cues within the frame allows for the character or subject as the focus, to define their environment rather than to be defined by it. In the same manner the Digital ASW has the effect of stripping the scene of all references to a real space, allowing the digital subject to redefine its environment. In relation to Lazzarini's installations the phenomenon of the Digital ASW is what sends the viewer spiraling into vertigo. Just as traditional anamorphic images catalyze movement in the viewer, who must attempt to grab and maintain an optimal vantage point in relation to the picture plane, so too do Lazzarini's sculptures urge the viewer to locate a fixed viewpoint. The digitally distorted objects, however, resist attempts to be visually apprehended, oscillating between one distorted form and another as the viewer moves. Ultimately the objects seem to be visual indices of a cold, digital world, which, we not only cannot grasp, but cannot successfully, inhabit or orienteer. The deep sense of frustration and the dizzying physical reaction that one feels when immersed in a bare

room furnished only with these objects is evidence that the installation space has lost many of its references to real, corporeal space, and has instead taken on certain virtual realities of the Digital ASW.

While Lazzarini disorientates the viewer by completely removing the fixed, inhabitable viewpoint from the perspectival continuum, William Kentridge experiments with a confluence of infinite numbers of fragmented, but fixed viewpoints in his anamorphic works. Dealing with vision, optics and perspectival distortion both artists use distorted perspective as a means of accessing their viewer's awareness of perceptual experience as subject matter. However, Unlike Lazzarini, Kentridge's anamorphic works do not focus on the digital subject, but rather use the digital as a means of investigating visual paradox and movement, simulacra, artifice versus reality and disclosure versus omission.

6. The world through the looking glass

Kentidge's work "what will come (has already come)" (Fig. 9.1, 9.2 and 9.3) demonstrates a different application of anamorphosis involving a cylindrical mirror, a technique used widely during the Renaissance to disseminate messages of a subversive nature. This work visually illustrates the two poles of perception, by presenting the viewer with a distorted, moving, digital image, projected on a flat horizontal disk that is resolved in a conical mirror in the centre of the disk, thus pitting the 'real' against the 'virtual' and the 'true' against the 'false'. (Breidbach 45) The technique used differs from Renaissance methods in one way only: the images that appear on the disk are projected motion images. The inclusion of projected digital images may

seem like a minor adjustment to a long established *trompe l'oeil* technique, but its implications for perceptual experience are many and complex. It is the innate temporality of the digital motion image and the ephemeral quality of its projection that triggers a bodily reaction on the part of the viewer, and thus incites the performance of the piece. One's awkward movement around the piece and the inability to parse, visually the entirety of the story, makes the artwork's intention, its message, very clear. Dealing with the history of the Italian invasion of Abyssinia, Kentrigde confronts the notion of writing, and re-writing histories, from several different perspectives. While he represents an historical event, he simultaneously questions the very authenticity of that representation. The unattainable perspective and visual paradox acts as analogy for the subjectivity of oral and written history.

Fig. 9.1. Kentridge, William. *What will come, (has already come)*

Fig. 9.2. Kentridge, William. *What will come, (has already come)*

Fig. 9.3. Kentridge, William. *What will come, (has already come)*

A striking motif that runs through Kentridge's oeuvre is his fixation with vision and optics. In an interview with Angela Breidbach Kentridge admits that a fascination with the politics of vision, and his studies of movement in drama, prompted his extensive experimentation with early cinema and animation devices. (breidbach 12) By adapting the centuries old techniques and devices into artworks Kentridge has been able to confront and challenge contemporary audiences' somewhat habituated notions of vision and motion. As an animator primarily, Kentridge has a sophisticated understanding of the persistence of vision and the ability to fragment the infinite fluidity of motion into a series of static images. In his first static catoptric anamorphic drawings, the focus of the image lies in the construction of a readable object in the inwardly projected space of the mirror, and the obvious simulacral paradox between this image and the distorted, real world one that exists in our corporeal reality. (Breidbach 41)

As Kentridge progressed to his animated film "what will come (has already come)" he began to construct landscapes with curved parabolic horizon lines describing a space that exists within the cylindrical confines of the mirror. (Breidbach 46) Traditionally landscapes defined by the horizon line are effective because they suggest that the viewer is at the centre of the scene, literally the axis around which the horizon is constructed. With the horizon now wrapping around the cylinder, and one's own image appearing in the same space, the viewpoint has fractured into two separate perspectives, one completely external to the scene, and another at the centre of the disk, somewhere inside the mirror. Kentridge's progression from the conventional definition of an horizon within a defined frame, to the construction of a curved

horizontal space around a central and disembodied axis (mirror) apprehends the viewer's sense of agency, and simultaneously frustrates their typically visual perceptual standards.

The digital projection of the animated film "What will come, (has already come)", introduces a sense of temporality typical of Kentridge's experiments with visual phenomena. If one took a fixed position in relation to the mirror and watched the animated film from start to finish, they would have witnessed a mere fraction of the artwork. The result of displacing the viewer's perspective from their body and positing it in this reflective, curvilinear, two-dimensional plane, is that each viewer has a completely unique, private experience of the piece dependant on a number of variables. The image also changes, the peripheries shifting with each movement the viewer makes closer to, further away from, or around the circumference, which means that with each movement, the viewer is witness to a spontaneous moment in the life of the artwork. The scene reflected in the surface of the mirror facing the viewpoint directly opposite the one taken by the viewer, remains a mystery, and as one moves to gain access to it, they are forced to abandon the comfort of their fixed perceptual position. A strong sense of frustration is invoked at the inability to see the entire artwork, to witness the action of the animated scene in its absolute entirety. The only possibility for resolution lies in the viewer's movement, and so it is through the ephemeral temporality of the digital projection and a disembodied vantage point that Kentridge is able to invoke the viewer's performance.

Both Kentridge and Lazzarini have combined Renaissance anamorphic techniques with digital phenomena to enhance the significant shift in

perception that anamorphic images induce, from the visual to the haptic, and in so doing have created a catalyst for human action or performance that speaks of our interaction with technology. In the following chapter I will explore how anamorphic projections inspire human performance through their delineation of a fixed perceptual viewpoint and investigate the significance of this performance in terms of our relationship with digital technology.

7. Performing the Digital

As is evidenced by Lazzarini's *Skulls*, the digital simulacra of the mundane can have such a significant psychological effect that it induces a physical reaction on the part of the viewer. The physical reaction is not confined merely to a very corporeal sense of vertigo, or dizziness, but extends to the way in which the viewer interacts with, and moves through the space. An everyday space is transformed into a site of play, of exploration and novelty an observer's movements become dramatized expressions of a perceptual struggle. The awkwardness of the viewer's movement around the artwork is almost comical, and at some point during ones immersion in the performance of viewing, a strong sense of self-consciousness takes hold. One becomes physically aware of the otherworldly nature of the digital dimension, and like any tourist, clumsily searching for comprehension one becomes awestruck by their own ignorance. Presumably it is the somewhat foreign juxtaposition of the digital dimension and the anamorphic perspective that give these artworks the power to incite performance, but there is much to be said for the power of simulacra in truly cementing the effect.

Looking at Lazzarini's work, the discomfort one begins to feel in the realization that the digital world you are being asked to inhabit is one that you cannot control, indeed one you cannot even understand, is created by the incongruent juxtaposition of the genuine and the artificial. When viewing works like *Payphone* (fig 8), one recognizes the object and its materials, one even relates to the small stains and scratches etched into the metal, those visual cues that suggest a history of use, but the inability to resolve its form through physically repositioning oneself and in turn putting to rest the visual paradox, leads to a marked corporeal reaction within the viewer. It is clear then that the use of distorted perspective in the creation of a window into the visually alien lexicon of the digital can lead to an embodied, haptic experience of both the virtual space and ones immediate physical environment made accessible through the power of simulacra.

Kentridge's manifestation of the viewer as performer happens through a kind of simulacra of perceptual experience itself. The disjunctive removal of the perceptive organ from the viewer's visual senses to a de-centered, disembodied vantage point, gives the viewer the feeling that they are, both perceiving, and being perceived. Much like Brunelesci's displacement of viewpoint and subject and the ensuing physical manifestation of the gaze itself, Kentridge's catoptric anamorphosis lends itself to a similar series of convoluted perceptual shifts that ultimately inspire movement on the part of the viewer. The Resulting performance that takes place in reaction to the artwork speaks quite eloquently of the inability of the human subject to relate to the elemental premise of the world of his digital tools.

Kentridge's *What will come (has already come)* sets up a scenario where reading, viewing and performing become a part of the viewer's interaction with the piece. The observer is at first struck by a significant visual paradox that works on a number of different levels. Firstly the device aggravates an uneasy relationship between the 'false' image in the 'real' world and its apparent resolution in the 'artificial' space of the mirror. The tension of this relationship is further heightened by the fragility of the projected image, whose translucency makes it vulnerable to the interference of shadow and light. Nothing in the real corporeal space of the viewer seems fixed. As the observer is coaxed into movement around the piece, attempting to view the world reflected in the cylinder, they become aware of their own distorted image appearing within the mirror's undistorted landscape. Now the observer realizes that they are witness to the manifestation of their own gaze, and as they watch their own image melt and warp with each movement they make, the disembodied displacement of their perceptual apparatus is cemented. (Breidbach 45) After one has achieved relative comfort in coming to grips with the idea that their perceptual space has been collapsed into the centre of the cylinder and has simultaneously inserted them into the image plane as subject matter, the viewer must surmount another hurdle, one defined by the temporal possibilities of the digital. What overwhelms the senses is that it would take an eternity to occupy each of the thousands of possible viewpoints for the running time of the animation and so, the temptation to chase the action, indeed chase the many perspectives, forces one into action, albeit somewhat fruitless. But, Kentridge has found a way of easing this frustration by involving the viewer in the creation of the artwork. The viewer becomes an implicit

subject in the piece and as they perform their own very personal act of viewing, and moving, they take away with them an experience entirely unique to themselves in that moment.

The work of Spanish artist and architect Pablo Valbuena uses augment anamorphic projections to dissect; open and expand real space by way of the digital, inspiring awkward performances from its viewers. His work combines the audio and the visual to powerful effect. The strange sound of what appears to be some kind of alien scanning equipment, is coupled with the anamorphic projections of either digital space materializing in real space, or glowing digital lines defining space beyond the material borders of a real space. The digital scanning sound and the virtual spaces waxing and waning before the viewer's eyes have the effect of activating the history and physicality of the environment, imbuing it with renewed significance.

A digital virtual simulation of the space around which the piece is composed, and then projected into, leads one to question their physical reality. One begins to question the limits of their corporeal space, investigating its substructure, its basic form and furnishing details. Pieter van Bogaert, in his article *Projection- Injection- Incision; About Pablo Valbuena's 'Extension Series*, describes Valbuena as a cartographer and architect. (van Bogaert) [6]Fluorescent lines delineating space beyond and within the walls, what van Bogaert describes as 'seems', open up the space around the viewer to its latent potential. (van Bogaert) In Valbuena's 'Para- Sites' (Fig. 10) the space's blue prints become visible, a map of the space pours out into a fourth dimension beyond actual reality. Simultaneously, in works such as "Puntos de

[6] http://www.squarevzw.be/pieter/specters/valbuenaen.htm

fuga" (vanishing point) (Fig 11) the artist's injection of virtual, three dimensional light structures into the space, and their materializing and consequent dissipation, act as a kind of microcosm of the history of the process of urban construction. The minute furnishing details of the space that Valbuena chooses to highlight act in opposition to Deleuze's concept of the Any-Space-Whatever. Instead of creating a visually non-descript space that can change its identity from real to virtual, as Iazzarini does, Valbuena replicates the fundamental elements of an actual structure in a virtual dimension. What results is a site-specific phenomenon, a portal into the virtual potential of an everyday space.

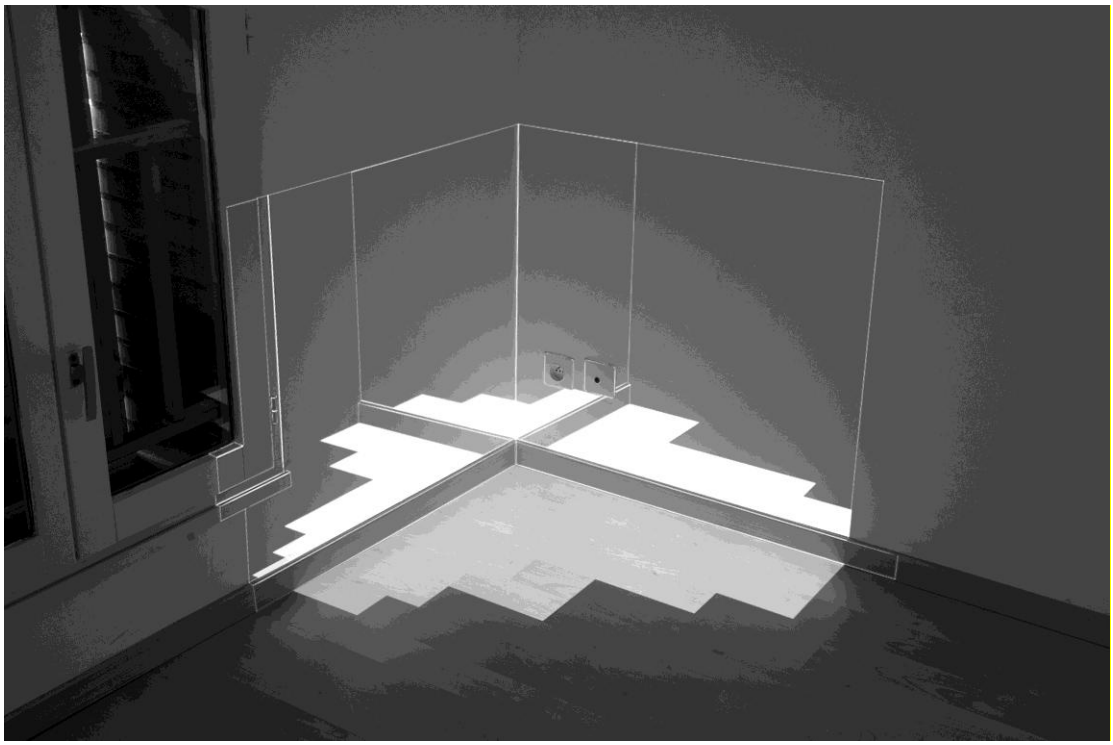


Fig. 10. Valbuena, Pablo. Para sites, 2009

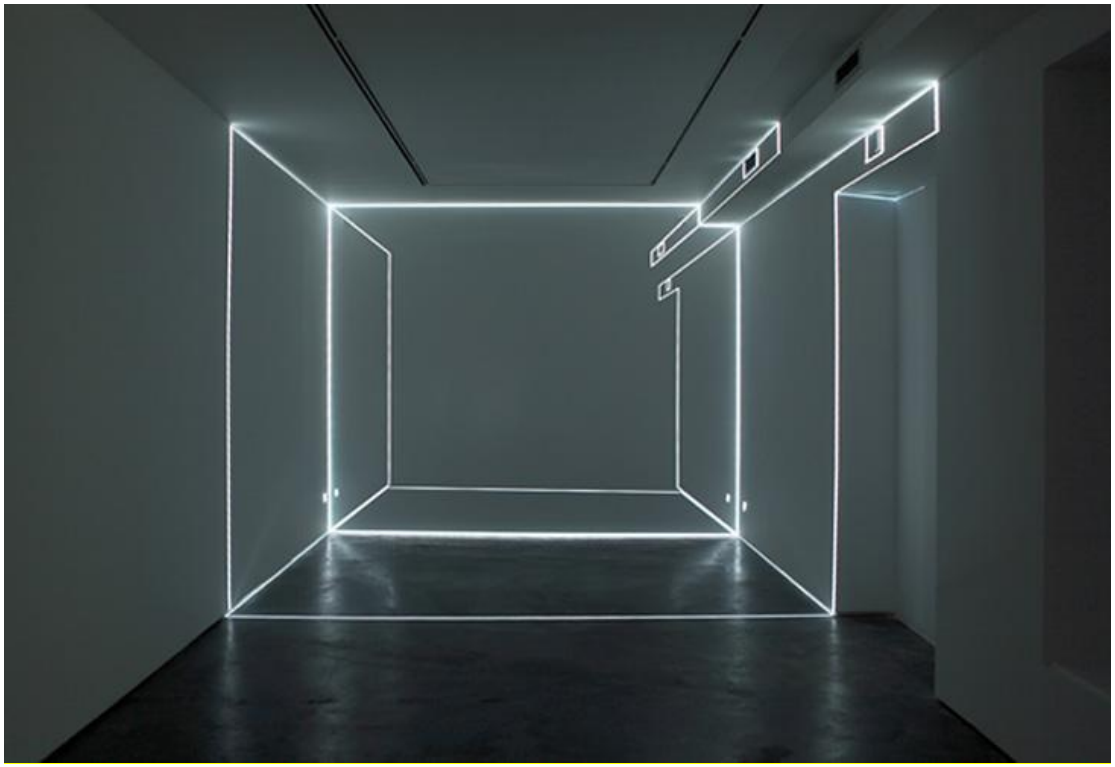


Fig. 11. Valbuena, Pablo. Puntos de fuga (vanishing points), 2008

The success of the illusion relies on the construction of a set of projected and visual angles that prompt the viewer's movement (Van Bogaert). Working on the basic premise of the architectural units that make up the spaces, Valbuena creates extended virtual spaces by replicating the actual structure in mirror images off at right angles to one another. The expanded virtual space suggests the innate virtuality of the real space. (van Bogaert) The viewer experiences a perceptual shift similar to that experienced in relation to Lazzarini's work, one becomes acutely aware of the sliding physicality of their surrounding. But what makes the perceptual shift so pronounced is the break in illusion, the tangibility of the digital. Van Bogaert points out that the artist has included "…small imperfections that add a little

humanity to this computer-driven work…" (Van Bogeart)[7]such as the serration of digital lines and dotted or pixilated seems that speak directly of the digital, of the virtual realm imposing itself on the real. The Viewer is invited to circle the work, interfere with the light being projected, even to stand 'within' the virtual light- architecture.

As is typical of all anamorphic projection, the viewer must inhabit a fixed position in order to resolve the image. Valbuena's play on the spaces in which he projects his animated architecture relies only partly on the resolution of the anamorphic image, for once the viewer has grasped it visually, a very corporeal reaction takes place which initiates the viewer's movement. In a sense, although far less so than in Kentridge's work, it is the movement of the viewer that holds so much significance for the artwork's resolution. Kentridge ropes the viewer into the image plane, casting them as characters in his film. Lazzarini invokes a stilted and awkward performance from the viewer that speaks of disconnect between actuality and digital virtuality. Valbuena casts the viewer as a transient ghost, momentarily haunting a structure that has a physical history, which spreads out fourth dimensionally into the past and future. The viewer's performance suggests an engagement with the history of the space, with its very basic elements, its plan, map or blue-print, with the fluidity of its physicality. (van Bogaert) For Kentridge the subject matter is the gaze itself, for lazzarini it is the digital dimension and for Valbuena it is the innate virtual dimension of the real.

[7] http://www.squarevzw.be/pieter/specters/valbuenaen.htm

In the following chapter I will describe how my own practical work invokes the viewer's performance, giving rise to a conversation between the past, present and future of the space through the language of the digital simulacra. I will question how the work is able to activate both, actual and virtual space and the viewer, the relationship between the two, and the significance of this interaction.

8. Recalling the history of an everyday space.

The neo-classical architecture of the South West Engineering Building and my interest in holographic, and anamorphic images lead me to create a site-specific projected installation, modeled after the atrium in the South West Engineering building. (Fig. 12a, b, c) After modeling the atrium space in 3d computer software, I ran a camera through the virtual space, matching its position and movement to the approximate trajectory of the viewers' gaze. The resultant video is anamorphically warped (Fig. 13) and then projected onto the floor of the actual space. The final result is a visual illusion of a room dropping into the floor of the atrium, as if there were another, identical room below. As is intrinsic to all anamorphic images, the viewer's position is fixed in order to maintain the illusion. The virtual camera's tracked movement of the hypothetical viewer, however, gives impetus to the viewer's movement, directing them, by means of their own visual apparatus, through the space.

Fig. 12a. The final modeled space

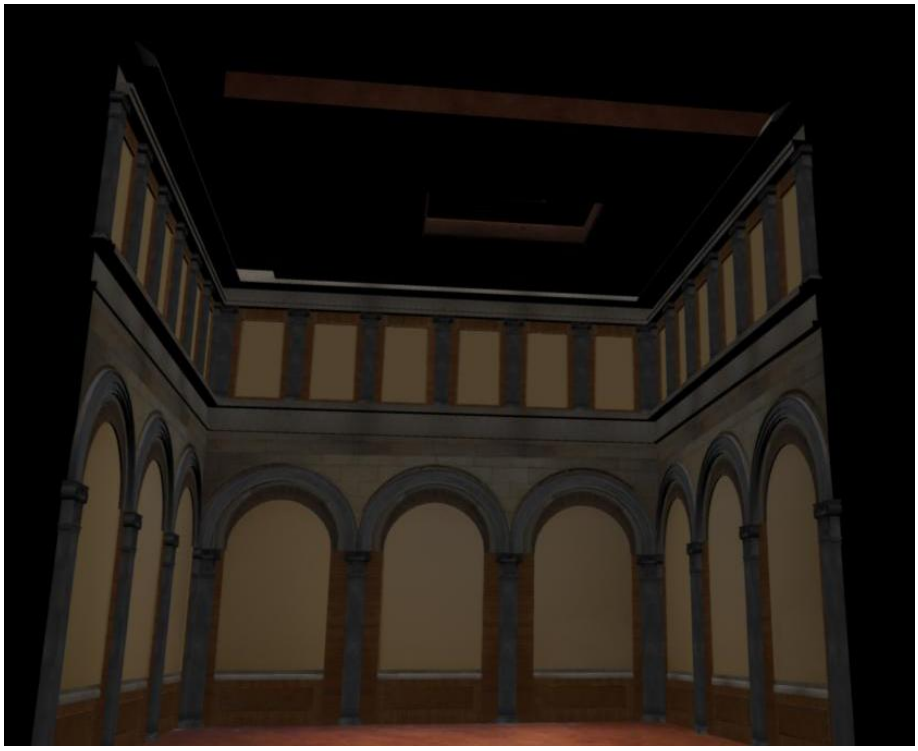


Fig. 12b. View to the viewer’s perspectival frame.

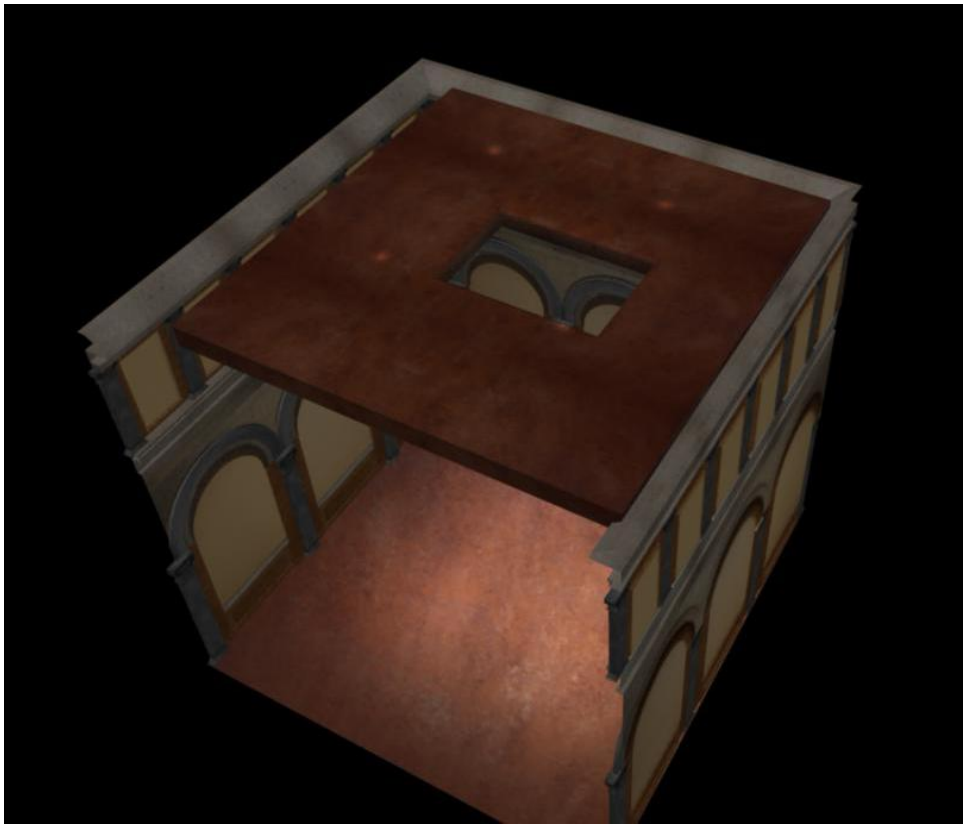


Fig. 12c. Birdseye view of the final CG scene.

Fig. 13. Stills from the anamorphically warped pan through the room, rendered from the viewer's perspectival camera.

The process undertaken in the construction of the piece was marked many unforeseen technical problems that altered the final product quite considerably. Once the video was first projected, it became clear that there were many variables that I had not accounted for in my process. When following the movement of the camera's tracked route the viewer was only

able to resolve the visual illusion at certain places. The speed of the camera's movement, the height of the viewer, their distance from the piece and finally the size of the projected trapdoor all interfered with the maintenance of the illusion. As a result I turned to several alternative solutions in order to find a solution to the application of linear distortion to a moving three-dimensional image, outlined below.

Initially the process of creating a visual illusion of a trapdoor leading to a room below the one the audience inhabits using anamorphic distortion seemed somewhat straightforward. I first modeled the Atrium of the South West engineering Building to scale in 3D software. Then, marking out the trapdoor area approximating the projection space, I created a camera that aims through this trapdoor space into the modeled room. (Fig.14) The camera, set at approximately a 45-degree angle from the estimated eye line of the viewer (averaged to 1.4m) pivots around a central axis along a marked route that the viewer would walk. Once rendered, the entire video is subjected to a linear anamorphic warp. The result was to be a successful illusion of the atrium space visible below the actual space through a trapdoor in the floor.

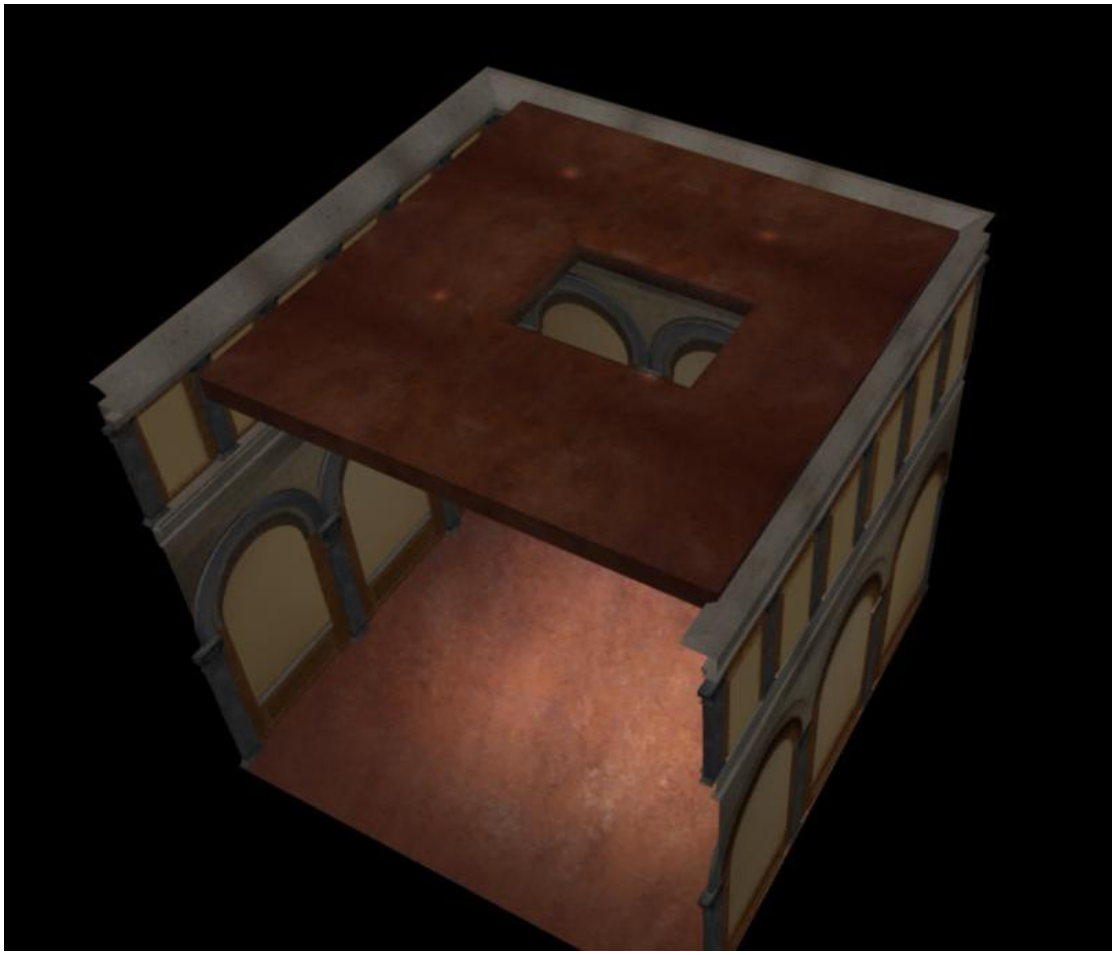


fig. 14. The complete model.

The illusion, however, was successful at only certain instances in the motion of the camera's tracking of the route. The problem stemmed from the application of a typically linear distortion to a three-dimensional, moving image, the myriad viewpoints along the route could not be accounted for by the linear distortion.

Without the interactive element of live camera feed to an algorithm based animated projection, the number of variables that would need to be accounted for in the movement of the viewpoint became overwhelming. Together my supervisor and I found two possible solutions. The first was to mark out a route for the viewer on the floor of the actual space and using a reflective

surface laid down in the trapdoor/ projection area, trace the reflection of the arches and corners of the actual room at several different points along the route. (fig. 15) The images would then be matched to the digital model and the camera keyed along the route. The result would be an inverted room, stretching out below through the trapdoor space.

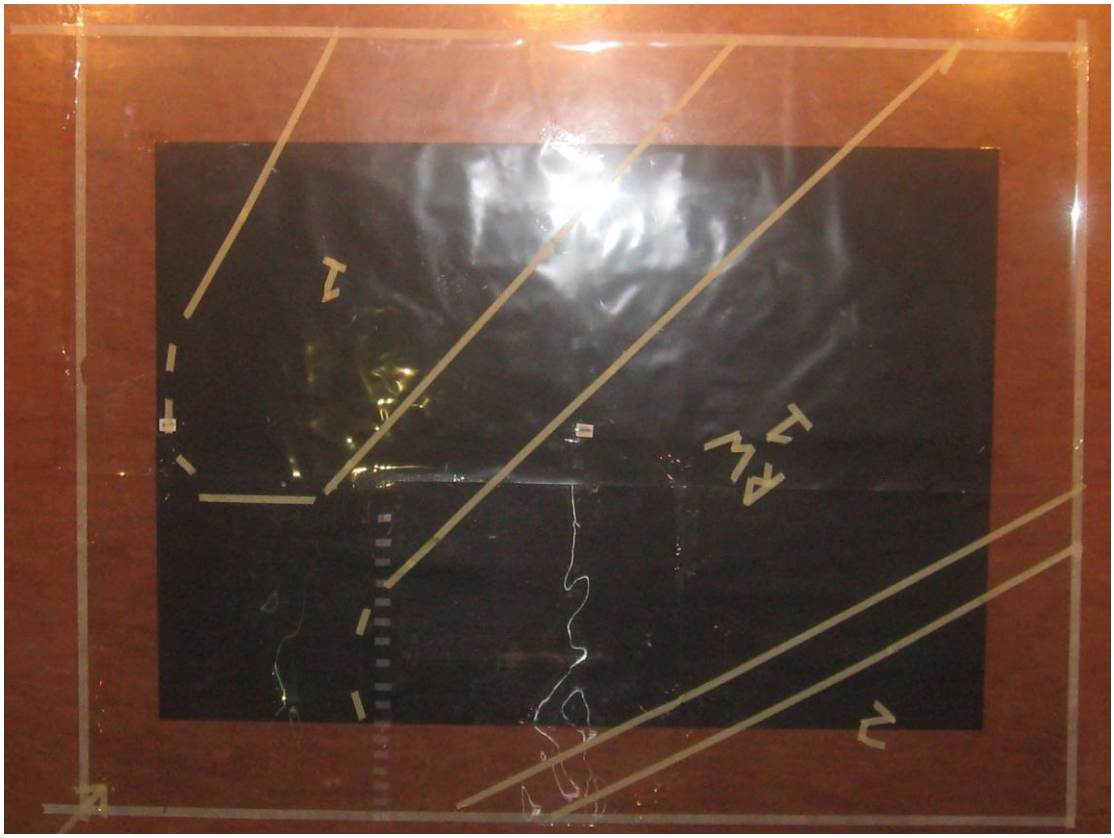


Fig. 15. The marked reflections of the actual architecture.

The second possible solution would be to maintain a fixed viewpoint and apply the linear distortion to this static image. The trapdoor would be animated closing and reopening at another point in the room, instigating the viewer's movement from one trapdoor to another in order to fulfill the illusion.

The first solution proved unsuccessful in that the digital model was not easily matched to the tracings of the very distorted reflections of the actual

architecture. (Fig. 16) In response to my lack of success with this solution, I took these images and attempted to create two-dimensional approximations that would later be sewn together in After Effects and animated. The level of distortion however proved to be too extreme for this and I moved to my final solution.

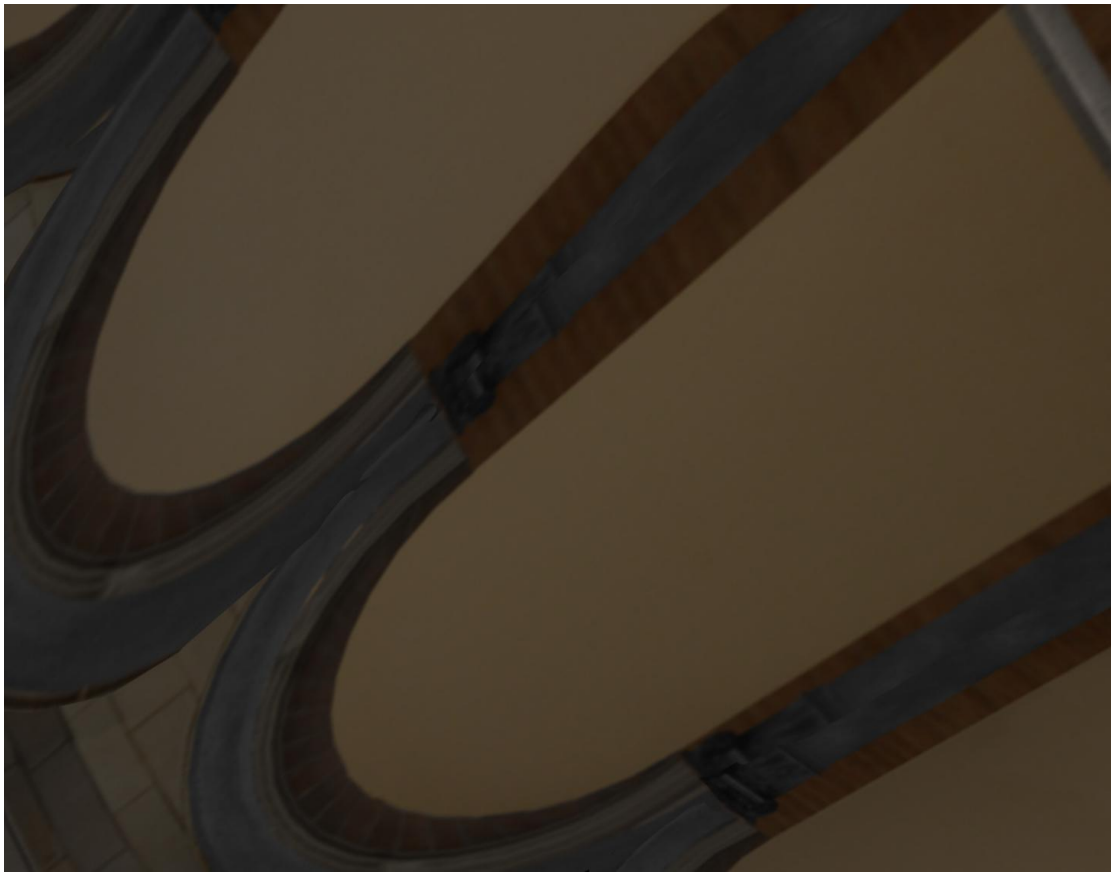
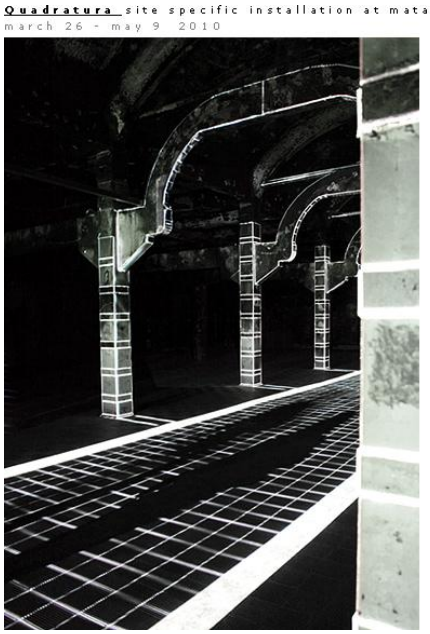


Fig.16. One of the approximated images of the reflected space.

The animated trapdoor closing and reopening in another space seemed to work best as it made use of the traditional application of linear anamorphosis. However the result was a very static image and the work seemed very obvious, almost pointless. In the process of unpacking the problems with my projection I came to the realization that my original projection was, in fact the

most effective because of the frustration that it ignites in the viewer. Because the work is not easily visually grasped at every point along the route, the viewer feels frustrated by their inability to access the virtual space successfully. I returned to my original projection and worked with the awkward relationship it has with the viewer.

The portal that one now looks through is not only a window into the virtual world, but also into the time stream of that space we inhabit. The shifting viewpoint gives us glimpses of the corners of the room below that can be seen when the viewer moves in time with it. The temporal element is significant in creating a sense of limitless virtual space that is omnipresent in our reality. If one can lock onto the viewpoint and not loose pace with its trajectory, they are witness to an entirely virtual world existing parallel to our reality. When one looses track of the moving viewpoint, the virtual space is inaccessible. The performance of finding the perfect viewpoint and keeping pace with it begins. Like Ridley Scotts Neanderthals, of *2001 a Space Odyssey*, clumsily discovering a nondescript black obelisk, the contemporary self acclaimed ‘computer-savvy’ viewer seemingly looses their hand-eye coordination and cognitive function when confronted head on with an alien digital portal into the virtual.



(Fig. 17) Valbuena, Pablo. *Quadratura,* 2010

This strange phenomenon, witnessed in Lazzarini, Kentridge and Valbuena's work, lies in the specifically digital visual language of their simulacra and the illusionistic effect of the anamorphic projection. As in Valbuena's work *Quadratura* (Fig. 17), the space chosen to intervene in has the overall architectural style of the Baroque period, so too does the South West engineering Building. Valbuena uses the Abierto X Obras room at the Matadero de Madrid in Spain, making use of the columns and buttresses, he projects a layer of virtual blue prints, and augment architecture over that already existing. The significance of the use of baroque style structures lies in the history of the evolution of trompe l'oeil techniques from their architectonic functions in buildings of the Classical and Baroque eras. These grand buildings constructed in unit-like sections, display awe-inspiring precision that is fundamental to the way in which we interact with the spaces. The South

West Engineering building's high ceilings, ornate columns, sandstone arches and dim lighting give the space a church-like resonance. What my anamorphic projection does is simulate the space exactly, as if seen through a trapdoor in the floor, the effect is to reassert the original grandeur of a space, whose contemporary function as administrative centre, seems somewhat eccentric. As one begins to search for and maintain the optimal viewpoint they find themselves, quite self-consciously, performing their awkward reaction to the spatial paradox of the anamorphic image. The physical reaction to novel, and somewhat alien, visual stimulus and the resulting performance in this interstitial, transitory space, allow one the luxury of pausing to take in the architectural grandeur, reconsidering the space's function.

The history of the space is then called into question and as the viewer ducks around and adjusts their pace to maintain the illusion they become aware of the temporal trajectory of the space itself. What is the origin of the space? What was it used for, and what will become of it in years to come? The space's history is activated through the stilted performance of the contemporary viewer attempting to come to grips with a digital portal into the virtual space/time continuum.

9. Conclusions

Historically the use of anamorphosis in the warping of static two dimensional images has been successful in creating visual illusions of virtual or imaginary spaces. The affectivity and application of these images are vast and have historically played significant roles in different cultural spheres.

When applied to the digital the distortion has the power to open dialogue between the human subject and a world increasingly defined by the digital. Whether the distortion has the effect of reasserting the centrality of the human participant as a centre of indetermination (Bergson in Hansen 3-8) or recalling the history of an actual space via the virtual simulacra, its use in new media art, although fairly novel, will have many applications in the near future.

When dealing with history, temporality, space and digitality, the anamorphic image seems to give the viewer access to an alien world with which we work symbiotically and simultaneously struggle to negotiate or comprehend.

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Fig. 12.a-c. Edwards, Natalie. *Process shots*, 2011.

Fig. 13. Edwards, Natalie. Stills from the anamorphically warped pan through the room, rendered from the viewer's perspectival camera, 2011.

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