From Vision to Drawn Metaphor
An Artistic Investigation into the Relationship between
Eye-Tracking and Drawing

by
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Abstract

At its most essential drawing consists of the making of marks on a surface, however such an interpretation does not necessarily reflect the diverse practice of artists whose work seeks to challenge the conventions of drawing and establish new boundaries. This abstract documents a practice involving a new consideration for drawing which focuses on the active process of drawing as a physical and perceptual encounter. It proposes that eye movements and their associated cognitive processing can be considered as a drawing generating process. It does not seek to undermine the conventional three-way process of drawing involving eye, hand and brain but presents ideas which push against the established boundaries for drawing practice and has investigated new ways of making and new ways of considering the practice of drawing as a phenomenological contemplation. The proposition for drawing presented in this document, has been developed through a practice-led enquiry over the last eight years and involves using scientific methodologies found within the area of Active Vision.

By examining artworks produced within the early part of the period of time defined within this thesis, emergent ideas relating to the act of making in-situ drawings and the recollection of such experiences brought about a series of questions regarding the process of generating a drawing. As the practice developed, using data obtained from different eye-tracking experiments, the author has explored the possibilities for drawing through using scientific methods of tracking the act of looking to investigate the relationship between the observer and the observer entity. Using the relationship between the drawn mark and visual responses to it as the basis for a practice-led period of research, this thesis presents the notion that by using
technologies designed for other disciplines artists can explore the potential for
drawing beyond the conventions cited above. Through the use of eye-tracking data the
artist and author seeks to firmly establish the use of this scientific methodology within
an artistic framework. It is a framework that responds to new ways of thinking about
spatiality and the relations between sight and thought, taking into account the value of
experience within the production of art; how the physical act itself becomes the
manifestation of a process of drawing, understanding and knowledge of the world
around us.
Dedication

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Declaration

I declare that this thesis is my own unaided work. It is being submitted as a partial fulfillment for the degree of Doctor of Philosophy at the University of Bedfordshire.

It has not been submitted before for any degree or examination in any other University.

Name of candidate: Catherine Baker

Signed:

Date:


1. Introduction

This thesis details a period of examination by the author of her own practice-led research between 2004-2010 whilst simultaneously referencing the practices of artists whose activities lie within the concerns of this document. It represents an evolving journey through drawing embracing scientific methods and artistic outcomes, concluding with work that considers drawing as a phenomenological contemplation. In essence this thesis presents a proposal for drawing that relates to the role of physical movements in drawing; questioning the conventions of drawing as a three-way process involving the eye, brain and hand combined in the act of making marks upon a given surface. It does not seek to undermine the tradition of drawing but instead poses a question for continued examination both through further practice and research. Furthermore, it should not be construed that the artistic work referenced here has been drawn to a conclusion, for the purpose of this document it must be summarised as the enquiry continues still and the concluding chapter indicates the nature of new research questions that have arisen.

Eye-tracking methods have a long history with the first eye-tracking observations made in the late 1800’s by Javal; these early findings were carried out without the use of eye-tracking technologies. Shortly after Edmund Huey constructed the first eye-tracker that involved quite an invasive method, it required the participant to wear a supposed painful device attached to the eye, somewhat similar to later constructions devised by Russian psychologist Yarbus in the 1950’s to measure particular conditions. Technological advances in this area have developed significantly since the early painful experiments conducted in 1908 as we now have access to lightweight
portable apparatus that can surrender outstanding results by comparison. Throughout the period of practice identified I have adapted systems developed in conjunction with the static eye-tracking labs at Bristol whilst also accessing a mobile eye-tracking system developed by Dr. Ben Tatler at the University of Dundee.

Over the past eight years I have been developing data from various eye-tracking experiments to explore the proposition that the eye movements themselves can become the metaphorical mark. This has formed the basis of my work for some time and continues to influence it still and it is presented as a key research question within this thesis. Through my own work and by presenting that of individual artists whose work challenges convention and explores the significance of physical movement as a key process, this document suggests that collaboration has enabled artists to explore new realms for developing drawing as a manifestation of ideas and process. By examining examples of contemporary drawing practices it is clear that artists are constantly questioning approaches imposed upon them by existing terrains within their chosen area.

The advancement of new technologies and collaborative working practices has enabled artists to extend the dialogue for drawing, the examples referenced provide a context in which to locate and endorse the development of the practice central to this document. In addition, key examples referenced in this text made a significant impact on the way contemporary practice was thought about more widely and their inclusion is essential in order to establish the contribution made. Alternative methods of production, developed in the late 1960’s by identified British artists influenced emergent practices at the time but contributed significantly to the revival of drawing
that emerged within fine art in the mid 1990’s which, in part, began to explore the notion of drawing beyond traditional, established methods.

In response, this thesis will show how the creative work of the artist, examined here, contributes to the idea of observation-based practice as a measurable interpretation of the interconnectedness of vision and intention as a basis for developing new processes for drawing. Within this context, the work of British artists Claude Heath and Jeremy Wood are considered alongside contributions made by Hamish Fulton and Richard Long, to establish an expanded dialogue regarding the relationship between physical movements and the processes of drawing. Importantly, within this dialogue, the role of new technologies that have made possible the mapping of physical movement will be identified.

In addition this thesis seeks to discuss the relationship between art and phenomenological experiences of place through carefully considered methods of production and the significance of visual qualities created within and by certain materials. The referenced artworks not only take into account the value of experience within the production of art; how the physical act itself becomes the manifestation of a process but also how the mode of presentation adopted by the artists, critically embeds the experience within the material outcome.

The considered references create a context for the practice-led research, which is, in part this document, beyond this it is a substantial on-going journey that originated in a need to understand or make sense of an essentially fluctuating environment. This grew into a number of questions regarding the relations between memory and vision,
vision and perception, and finally perception and experience. This enquiry has been supported by research into Active Vision, which considers the role of eye movements as important to understanding overt and covert attention.

New areas for practice-led research have grown out of this investigation and are identified within the concluding chapter of this thesis as potential contributors to the future on-going journey and evolution of this enquiry into how we, as artists, interpret the world around us. How we perceive, respond to, and interpret place as an artistic act, drawing upon the use of technologies ‘borrowed’ by artists to investigate the infinite connections above and beyond what we can see as an external event will continue to reveal potential areas for exploration.

Advances in new technologies, often developed for other purposes, enable artists to explore new approaches which test the validity of existing models and pave the way for fresh, inventive, and original thoughts that can only be born out of curiosity motivated discovery. Through utilizing scientific methods combined with studio based experiments the work of the author concludes with artworks that interpret drawing place as a phenomenological contemplation. Chapter 4 details a creative journey whereby the different methods are described more closely: studio and laboratory-based research methods, presentations of solo and group exhibitions, peer-reviewed journals and international conference papers. It is a journey involving the synthesizing of exploring, developing and generating data and evidence to support a reflective practice-led inquiry that communicates a new consideration for drawing.
It is intended that this thesis will contribute to establishing new methods for examining drawing in the future both through drawing research and through practice-led enquiry.

In summary this thesis draws attention to both the objective, scientific models of analyzing observation in relation to drawing, whilst embracing a more subjective, empirical attitude. The artistic journey described here, acknowledges the importance of collaboration to the development of a methodology that fuses the differing approaches used by the artist and the scientist, in pursuit of common aims, to extend the dialogue for drawing practice and research. Ultimately, the journey projects a more philosophical consideration for drawing, making a distinction between perception and experience of place by exploring drawing outcomes through a more sculptural, installation-based way of working, from which new areas of research can emerge.
2. Origins

The outcomes referred to throughout this document were all born out of an enquiry into the relations between the incessantly moving eye and the constantly changing world around us. However, in order to reach a stage where a clear practice-led research agenda emerged, a number of events had to occur in order to start a sequence of research enquiries that led to the development of a collaborative working practice with Professor Iain Gilchrist, Department of Experimental Psychology, at the University of Bristol.

Drawing was always and remains still a key area of my practice; my excitement for drawing was always allied with the opportunity to engage in drawing directly from observation, so in many ways the true origins of the work specified herein came from my earliest memories of drawing. For brevity and to be more specific, it developed from an initial investigation into the role of memory within drawing, which I explored throughout my MA in the late nineties, this sparked a series of emergent questions around the role of vision in drawing from life. Overtime the questions became more resolved and a clearer route emerged after two years of research into everyday memory and its relationship to perception. The discovery of rehearsal\(^1\) and flashbulb memory\(^2\) were important markers at this time and brought about changes of direction that led to the production of later works inspired by collaboration, and the development of an artistic practice-based methodology influenced by scientific

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\(^1\) Rehearsal, Baddeley (1990) – It works by means of repetition; it is the process whereby material is presented over and over until it is encoded. It can take place in any sensory proposition: visual refers to information that is looked at over and over again and motor also refers to repetitive events but more specifically pertains to drawing and writing actions.

\(^2\) Martin Conway (1995) author of Flashbulb Memory explains this unique condition whereby highly detailed memories, often associated with traumatic events or related emotional disturbances, can be made that are considered in some way separate from existing memory processing. Brown & Kulik first used the term Flashbulb memory in the 1970’s.
models. This was made possible through generous access to facilities and expertise at both the University of Bristol and later at the University of Dundee through Dr. Ben Tatler. The experiments conducted at both establishments are described in more detail in later chapters as their significance to my practice is beyond considerable. At this stage it is important to establish key moments and their associated artworks that initiated the line of enquiry that is still relevant in my practice today. This will happen throughout this document but will start with a brief description of how the collaborative element within my practice came about through a retrospect account of a particular series of artworks entitled *plotted drawings*. 
2.1 Retrospective

The plotted drawing series were the result of a number of in-situ drawings produced in Asia in late 1997. The in-situ linear drawings themselves were transcribed in pantone ink on paper and consisted of street scenes, mostly one-point perspective architectural drawings (see figure 1).

Figure 1. *In-situ drawing*, Ink on paper, w.31cm x h.46cm, Hong Kong 1997, © the artist.

The in-situ drawings became substantial in number and I began to notice certain characteristics within the inky deposits. Pantone inks are particularly vulnerable to bleeding across and through paper fibers; different paper manufacturing processes can increase or decrease this effect. I found that with most of the drawings some of the ink bled entirely through the substrate leaving a series of marks which varied in both size and intensity. It was clear that the bleed marks were caused by the idle hand and therefore related directly to episodes in the drawing process when ‘search’ eye movements had occurred. The marks seemed to interpret the selective scanning that
took place as part of the perceptual act of making; it showed the observer’s attention searching to find its objective in a perceptual field (Arnheim, 1969, pp.25).

Saccadic eye movements, which are described in more detail in Chapter 3, are characteristically short, ballistic, scanning movements and it was my understanding that these movements had become embodied within the drawing process (figure 2). Certain structures remained within the bleed drawings that positioned them within the genre of landscape but their simplicity instead drew attention to the elements that defined significant parts of the original experience. Whilst evolving the drawings, using photographic material as a prompt where necessary, I became aware that the drawings were a development of the process of ‘being in a place’ whilst encompassing the notion of ‘not being in a place’. Within this emergent methodology the role of the photograph, as an object providing the opportunity to revisit the original perceptual moment, grew in significance; objects becoming a focus, an axis around which a link could be established to an absent place.

These events became the basis for later developments that were key to ideas regarding an experience of place rather than a depiction of it. The drawings were intended to interpret an idea of location, carrying something of the structure of a place and my engagement with it. Ideas relating to the importance of physically being present in a place were beginning to emerge within the work so my focus centered on examining the physical process of making and how the drawing came to embody the act of observation and thought within its structure.

In the essay *Paper, Scissors, Blur* Mark Wigley (De Zegher and Wigley, eds. 2001, pp.29) writes on the occasion of Constant’s *New Babylon* exhibition at The Drawing Center, New York about how drawings are considered thoughts. He writes,
Drawings are seen as a unique form of access to the thoughts of the people that make them. Indeed, they are treated as thoughts. It is as if the materiality of the medium is transformed by the quasi-immateriality of the support rather than simply exposed by it.

This period of time confirmed my interests and initiated research into vision and the need to explore in more depth questions regarding what occurs in the viewing of visual stimuli such as landscape and what is its relationship to drawing? This question forms a part of this thesis and will be answered throughout its duration.

In retrospect I understand that the work made during this part of my artistic career formed the basis of all that was to happen in future work with regard to eye-tracking.

Figure 2. Plotted Drawing no.5, Ink on panel, 1m x 1m 2004, © the artist.
3. Active Vision

Although the visual world appears to be stable the sensory system we use to detect the visual world – the eye – is constantly moving (Findlay & Gilchrist, 2003). These movements are achieved by a set of six muscles that are attached to the eyeball. In humans, the eye generates a limited set of types of movements which all have distinct functions. These types of movements can be distinguished by the nature of the movement generated and the properties of the visual world that lead them to occur. The types of eye movements can be broadly classed into movements that keep the eye stable in relation to the world and movements that point the eye in a new direction towards something of interest (Walls, 1962).

When the world is stationary, saccadic eye movements move the eyes to point at regions of interest in the environment. Saccadic eye-movements are fast ballistic movements that are followed by a period of time when the eye is stationary called a fixation. Vision isn’t possible during the saccade so it is during these periods of fixation that information is gathered by the visual system. Fixations can vary considerably in their duration, from as little as 1/10 second to over a second. Saccades are required because toward the central part of vision, or the fovea, visual ability and particularly the ability to resolve fine detail improve dramatically. As a result of this drop off of visual ability away for the central visual axis we simply can’t see very much away from the current point of fixation. The illusion of being able to see everything with fine detail at once is just that – an illusion. When scanning a still scene the eyes make a sequence of fixations and saccades. An example of such a sequence is illustrated in Figure 3.
Figure 3. Example of a Scanpath, © University of Bristol

The term *Scanpath* is not widely known and was first used by Norton and Stark (1971) to describe this succession of fixations and saccades. What has been established is that the eyes do not move completely randomly around a setting but instead they tend to land on significant and meaningful parts of the image. As a result the sequence, location and durations of the fixations carry something of the structure of the picture.

Within the artistic community in the UK there has been little research involving the use of eye-tracking, Dr John Tchalenko, Research Fellow at Camberwell College of Arts and supported by the Wellcome Trust, has been comparing eye-hand coordination in painting and laparoscopic (keyhole) surgery. This work was disseminated via a series of small exhibitions across the UK in 2006. The following is a statement copied from the University of the Arts London - Camberwell research web pages:
My present work consists in observing how people draw and paint, using scientific tools to monitor eye, brain and hand behaviour, and the results are beginning to throw light on the process by which the brain transforms the external visual world into the artist's picture, i.e. on artistic creativity (Tchalenko, 2009).

The Tchalenko exhibition aimed to examine how we use our eyes in everyday life by comparing the eye movements of two experts - a painter and a keyhole surgeon. Later experiments made comparisons between experts and novices, engaged in the act of drawing, to assess how different the eye-movements were between the two groups of individuals. Tchalenko (2007) has also applied his expertise within the field of drawing although it is clear that my aims are in contrast as I propose that the act of looking is intended as drawing itself. Admittedly a rather direct and unconventional way of drawing but one that has a resonance with the work of individual artists mentioned in this essay, in particular Claude Heath, Jeremy Wood, Hamish Fulton and Richard Long.

As interest in eye tracking and other motion capture processes have developed and become the subject of creative exploration, artists such as Susan Morris have developed both drawn and textile based outcomes using such data. Morris uses motion capture software to generate drawings of her movements when engaged in a repetitive act; she also uses an Actigraph watch to monitor her cycles of activity and inactivity through the day. There is no doubt that these technologies are enabling artists to explore new methods for the production of art, however the question that should be asked is: are the outcomes meaningful to an audience? The audience might consist of fellow researchers, collaborative partners and, ultimately beyond specialist viewers, the wider general public. It is evident that many artists do not develop or adapt the methods they have access to but instead translate the data directly into a
visual form or simply enhance the existing visual look of the data. Surely the role of
the artist within interdisciplinary collaboration is to adapt and respond to existing
models in order to develop new approaches to interpreting the language visually or
through alternative sensory outputs? Working within the area of active vision was a
privilege that demanded I carry out an extended period of research in order to
understand the data collected through eye-tracking experiments. The data gathered
consisted of columns of numerical information which needed to be explored visually,
two alternative methods of outputting the data were developed in the labs at Bristol
using programmable software developed by the scientists, both of which are described
more fully in section 4.3. Active vision focuses on eye movements as key to
understanding visual attention so it was fixational and saccadic eye-movements that
became central to my artistic explorations. A fixation is the point in the visual field
that is fixated by the two eyes in normal vision, and for each eye is the point that
directly stimulates the fovea of the retina. After discussions with eye-tracking
manufacturers it was suggested that a fixational threshold should be reached in order
for a perceptual encounter to occur through vision. It is for this reason, amongst other
lesser contributing factors, that fixational eye-movements became central to my
artistic attention.
4. Practice as a research methodology

Carole Gray is an established contributor to the field of practice-based research and is well recognized for her articulation of the diverse research methods found with artistic practice. With Julian Malins she co-wrote the book *Visualising Research* (2004), which describes these methods in more depth and highlights the multi-method concept often adopted by artists.

The starting point for most practice-led research has come from issues arising from making or through engaging with reflective approaches to practice. These issues develop to become valid research questions that have value beyond individual practice as they contribute to a wider professional context. This describes my own experience which started as an awareness of events that occurred through practice that I, initially, could not explain. These issues demanded further investigation which, in turn, brought about a new set of questions; ultimately this led to collaboration beyond my own discipline. The broad range of practice-based methods arising from the act of making facilitates an array of creative outputs that provide the opportunity to critically consider such methods as robust procedures for research-led inquiry. The value of using and integrating different kinds of media found within and beyond the creative disciplines, can lead to the development of new considerations that have the potential to contribute to future research outcomes that will test existing ideas and encourage further investigation.
4.1 Eye-tracking data

Eye-tracking was initially identified through observation in the late 1800’s, it developed considerably over the following fifty years and eye-tracking nowadays is prolific in the design and analysis of many aspects of our daily lives. Researchers use it as a tool for designing for display layouts, marketing exercises, analysing website effectiveness and in the medical industries, generally for diagnostic purposes and research. Eye tracking software has developed considerably from the days of car dashboard design, although it is still highly effective as a research tool within this industry, and is now easily accessible for studies where the stimuli can be presented on a monitor. Swedish based Tobii manufacture screen based systems that have the ability to revolutionize communication for users with special needs as their method tracks where a user is looking within the area of a monitor screen. These systems have become commercially available to users however, I should like to draw attention to the fact that the different systems I have been fortunate enough to access, as part of my research, do not fit into this category.

Typically eye-tracking data from vision research labs comes in the form of numerical information, the labs at the University of Bristol contain high quality, precise tracking equipment that gathers data in a closed, static environment. The system provides accurate fixation data, describing both the location of the fixation within an x and y framework, and the fixation duration, measured in hundredths of a second. The process involves the use of two cheek-mounted camera’s that track the pupil movements of the participant over a defined period of time. Firstly, pupil movements need to be calibrated and this is carried out through a series of simple movements that track an intermittent mark on a computer monitor screen. The process demands that
the participant keep their head still throughout the experiment and this is achieved by
resting the head on a chin support. Both cameras are electrically connected to a head
brace, which fits tightly over the head ensuring the cameras do not move throughout
the tracking period. Conversely, the mobile eye-tracking experiments that were
central to the video work produced in 2006 onwards were less accurate but facilitated
movements outdoors with head movement being possible. Calibration was required in
the same way with only one camera being used to track one pupil, whilst a second
synchronized camera tracked the scene being looked. The equipment was far less
restricting and enabled a wider range of outcomes to be considered. The two methods
in conjunction with each other provided an overview of how the eyes moved around
the scene in two starkly different environments. The static lab traced finely detailed
responses to a flat image whilst the mobile data captured movements that responded
to distance at the location; the spatial aspect of the mobile data was responsible, in
part, for the development of three-dimensional or more sculptural outcomes within
my practice. It was at this point that a substantial shift in my work took place, as
stated this was in many ways a response to the mobile data and its potential to be
adapted within an artistic framework. More significantly it marked a move away from
the rigidity of responding to and respecting data gathered by scientific methods. This
isn’t to say that the work after this point was in any way disrespectful to these
methods but instead a more experimental approach to adapting the data was employed
which embraced the partially unreliable notion of tracking depth.

The static lab-based work at Bristol focused mostly on fixational eye-movements
although saccadic movements were also evident. The significance of the fixational
movements as moments of perceptual awareness provided an opportunity to extend
my research into memory and explore these short moments in more depth in order to explore visually the magnitude of what they represented.

The mobile eye-tracking experiments were carried out in locations in and around Dundee in February 2006 with the support of Dr. Ben Tatler from the University of Dundee. The six experiments conducted took place in both urban and rural locations and the nature of the environments seemed to dictate the nature of the eye movements. The city based outcomes showed the eyes moving at a faster pace, swiftly ‘rolling’ to check for changes in the environment such as traffic and other fast-moving objects. There were more obstacles to navigate around when walking and therefore the head movements were more prolific. This method works by recording the movements of one eye whilst simultaneously recording the scene being viewed. It is far less accurate than the lab based equipment although calibration of the eye-movements is set-up in a similar way. This system differs substantially in that it facilitates the wearer being able to move freely in most environments with the resulting data being accessible as video footage. The seemingly frenetic eye-movements were clearly captured by the video recording device that output as a split screen display with the eye footage on the left and the scene being viewed on the right. In the original video data there appeared to be some confusion as the eye footage was mirror-imaged and thus didn’t appear to correlate fully with the scene being tracked. The development of this data was initially sparked by these inconsistencies. The gap between the two forms of data obtained through different eye-tracking methods widened at points, but over time exploration brought the two methods more closely aligned. This process of alignment is described in more depth in section 4.3.
4.2 Context

In his seminal text *Visual Thinking*, *(op cit, 1969, pp. 19)* Arnheim states:

In looking at an object we reach out for it. With an invisible finger we move through the space around us, go out to distant places where things are found, touch them, catch them, scan their surfaces, trace their borders, and explore their texture. It is an eminently active occupation. Impressed by this experience, early thinkers described the physical process of vision accordingly, for example, Plato in his *Timaeus* asserts that the gentle fire that warms the human body flows out through the eyes in a smooth and dense stream of light. Thus a tangible bridge is established between the observer and the observed thing, and over this bridge the impulses of light that emanate from the object travel to the eyes and thereby to the soul.

This statement articulates, in a less scientific language, the relationship between the incessantly moving eye and the observed scene or object. Working within scientific domains can displace the artistic and the poetic but through its inherently visual description this statement somehow contributes to an understanding of the parallels between science and art.

My own experience provides a counterpart with this analysis. Scientific data however fascinating and informative, often involves working with an abundance of numerical figures; finding a way of extrapolating meaning from such source material can be challenging as an artistic practice.

Plato’s reference (360BC) to the soul implies meaning, however meaning seems to be a peculiar transitional entity between the viewed object and its perceptual interpretation; in response to the visual world the mark can assume a metaphorical meaning. Indeed Plato refers here to a phenomenological stance, drawing attention to the connection between the perceptual act of looking and the object in the real world.
Kant talks of the soul by proposing that the soul is not separate from the world,

They exist for us only in relation to each other. Whatever we know about the world is only a direct, immediate internal experience. The world appears, in the way that it appears, as a mental phenomenon (Powell, 1990, pp. 174, 185, 188).

Vision was a source of much debate for the ancient Greek philosophers and remains a phenomenon still under scientific scrutiny for although we are now able to map the movements of the eyes with incredible precision; the process of ‘seeing’ is researched and debated widely. In Greek thought visibility represents the ultimate certainty of a reality that must be confirmed visually. Cathryn Vasseleu (1998, pp.1) writes about vision within the context of light as she establishes the distinction between the Latin terms *Lux* and *Lumen* and she also refers to Plato whose writings frequently included reference to vision, existence and truth. She writes,

Seeing light is a metaphor for seeing the invisible in the visible, or seeing things in an intelligible form that holds all that exists together but is itself devoid of sensible qualities. By means of this metaphor Plato implies a natural relationship between existence and truth, or a concept of reality based on an original self presentation of beings which can be clarified through vision (*Ibid*, pp.3).

Conventional drawing techniques assume an understanding of drawing as a three-way process but drawing, as an autonomous discipline, has been the subject of much discussion since the early 1990s and as a result has received far greater analysis and has provided a platform for drawing research.

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3 This is summarised rather than directly quoted from the Critique of Pure Reason, Paralogism of pure reason, Ch.1 of Book II of Division II of Part II of the Transcendental Doctrine of Elements.

4 ‘Lumen’ refers to the physical movement of invisible rays of light whose perfect linearity is the essence of illumination and requires no organ of sight. ‘Lux’ refers to light as it is experienced in sight; generally speaking Lux is the subjective experience of light. The translation from Latin into English saw the loss of distinction between the terms, as they later simply became ‘Light’.
Steve Garner’s opening sentences in *Writing on Drawing* (Garner, 2008) are:

> Drawing today is characterized by diversity. Drawing practice and drawing research are increasingly viewed as symbiotic.

This thesis responds to drawing as a physical process involving biological functions but not simply as a vehicle to translate what is seen onto a surface but as a physical process that becomes a part of the experience of seeing, of judging, of formulating meaning and as a way of distinguishing between our biological and psychological ways of being. The extracts quoted about the believed relationship between vision and truth has been constant throughout a historical examination of phenomenology and remains still prevalent in the writings of contemporary theorists such as Sokolowski (2000). Using this knowledge and through the introduction of key pieces of artists work I intend this chapter to provide an anchor for my ideas regarding drawing practices.

In 1967 Richard Long made a piece of sculpture or drawing using his own body weight as tool. This piece ‘*A Line Made by Walking*’ has appeared in too many drawing lectures to mention here but is highlighted in Vitamin D: New Perspectives in Drawing (Dexter, 2006, pp-006). Although Long is known mostly for his work as a sculptor, within the context of her essay, Dexter describes land art as inescapably drawing. Long’s piece is explained as being made by walking upon the face of the earth, the idea was simply to “walk back and forth until the grass is trodden into an evident line.” The idea presented here according to Dexter is that the artist’s intentions reveal the earth as a surface or ground to be marked, etched or scarred by the body as the instrument of drawing. She goes on to write that,

*A Line made by Walking* suggests we all are artists when we are walking, and from this point, there is only a short step to understanding body movement as the drawing of invisible lines in space (*Ibid*, pp.006).
This statement comes in two parts and it is only the latter that I agree with as the first part overlooks the notion of intentionality from both a phenomenological understanding of intentionality but also using an everyday interpretation of the same word. She continues by saying,

In fact, this work proposes that our lives are a series of maps of lines between points as we move from point A to B across a given area (Ibid).

Although not cited by Dexter, the above statement could be attributed to British artist Jeremy Wood (see Figure 5). In his work Wood (2009) has made use of GPS technologies to map his movements in space. On his website Woods states,

All my journeys are recorded with GPS to make visual journals that document a personal cartography. The work is located in the actions and methodologies of geodesic drawing and physical map-making (Ibid).

He references time and place consistently within his work and some pieces have involved mapping up to a whole year’s worth of journeys. The journeys he traces exist in the experience of the walk and although they exist in the data held by the device they appear to be related to the real connection between the ‘inner and outer’ for the artist. Patricia Cain in Explorations in Spatiality (pp. 38), which also involved Claude Heath (see Figure 4), refers to the inner and outer and questions, “How much of me there is in the thing I create about an external subject.”

Figure 4. Claude Heath (2006) using the 3D Drawing software developed at The University of Leeds, courtesy the artist.
In stark contrast when Claude Heath described *Explorations in Spatiality* and the use of the same three-dimensional drawing software and tools developed by Ben Hammett, a final year undergraduate student at the University of Leeds, he states, ‘its just an event and this is the recording of an event (*Ibid*, pp. 28)’. He talks about the performative aspect of the work that perhaps is the notion that unites the practices of all the artists mentioned here, but Heath, unlike Wood and Cain, says that he is not interested in the performance but what’s left after the performance (*Ibid*).

Tracey P. Lauriault wrote for *The Cartographic Journal* (2009) of a conversation with Wood where he described that a simple shape being plotted on the screen of his
Global Positioning System receiver in 2000 sparked the idea of thinking about the possibilities of travel as an act of drawing. She talks about the disassembled tracings in his matrix exhibit and goes on to say that although they may hold personal information regarding the places he travels to and from, lingering or not, they do not delve into the private space of his life when the GPS is turned off. Wood comments at the same instance about the personal attributes each trace may reveal,

What strikes me about seeing one’s own tracks is in the triggering of memories, which is why I refer to them as cartographic journals. They are a record of where I have been and a daunting reminder of where I have yet to go. Among the intricacies in the line qualities, I can read my routes and ruts, and recall my dithering and my adventures. They are a ghost, captured in places of a different time (Ibid, pp.365).

In many ways this statement by Wood supports, in part and only as a reflection, my reasons for exploring eye tracking as drawing in itself. The conventional process of drawing allows the maker to revisit, respond and correct as the drawing evolves on a surface; as soon as a mark is made we respond to it visually, triggering past memories. This process actively recalls previous drawing encounters and as a result habitual responses can become part of the act of making; I observed this phenomenon in my own practice. Thus, the observational drawing being made can be affected by prior experiences of drawing resulting in a less ‘truthful’ translation.

A recent endorsement of this came at a conference on Drawing Practices organised by UAL and RMIT, Drawing Out 2012, where Grayson Perry spoke about how “people have habits” within their drawing. As part of the same round table event, Colin Wiggins, curator at the National Gallery, presented a selection of donated Auerbach drawings of Seurat’s famous Bathers at Asnieres 1883, it was clearly evident in the sequence shown that a repetitive, habitual drawing feature dominated the studies of
the bathers in particular. Reflecting on the work I made before I started eye-tracking experiments, I was conscious of a similar aspect within my own activities and upon initially studying the works of a few artists, a far broader survey revealed that there is a highly repetitive quality apparent in the work of many artists. This led me to enquire to what extent, when involved in observational drawing, is the artist responding to what is unfolding on the surface as much as to the scene attempting to be transcribed?

In my own experience I found that the method of rehearsing the act of drawing and the inevitable process of responding to the mark made somehow resulted in a drawing that was not fully about place, although that was the intention, and was entangled within, possibly diluted, by the very act of making. In the case of observational drawing this rendered the resulting drawing as not genuine in some way, not sufficiently free of prior experience or influence to achieve a truthful position.

Merleau Ponty talks of the relations between perception and judgment that supports my understanding of the phenomenon referred to in this paragraph. Ponty states,

…endowing the object as it does with properties which it does not possess on the retina…perception becomes an ‘interpretation’ of the signs that our senses provide in accordance with the body stimuli, a ‘hypothesis’ that the mind evolves to ‘explain the impressions to itself’ (Ponty, 1962, pp.33).

He continues his discussion to encompass attention and judgment and points out that,

We shall have only an abstract essence of consciousness as long as we refrain from following the actual movement by which it resumes its own operations at every instant, focusing and concentrating them on an identifiable object, gradually passing from ‘seeing’ to ‘knowing’ and achieving the unity of its own life (Ibid, pp.38).

Scientists analysing eye-tracking data believe that there is a threshold which marks the point of consciousness and it is at this point that we move from what Ponty describes as ‘seeing’ to ‘knowing’.
Knowledge regarding vision or sight in philosophy is linked to light as referred to earlier by Vasseleu and for Jacques Derrida, she says, light is the concept metaphor by which truth can be made to appear or become present to consciousness (op cit, pp.1). The importance of vision in our understanding of our environment and how eye-tracking might introduce an objective, data based truth to the development of that understanding, became a further focus for my research.
4.3 Artistic Practice

Through the early stages of the period of time defined within this document, my work explored mostly conventional approaches to making associated with drawing practice, such as graphite on paper, gesso panelled surfaces, and silkscreen printing. The first set of data gathered from the eye-tracking experiments was initially explored using existing methods, however, although the silkscreen medium supported a level of output that responded well to the finely detailed nature of the data, more conventional drawing approaches did not.

During the first day of experiments at the labs in Bristol, Professor Gilchrist, a neuroscientist, guided me through the process of using the eye-tracking labs and discussed the relevance of the data obtained. The data consisted of columns of numerical information, which described the duration, and location of my fixations. This data was gathered whilst I was looking at one of my own drawings for five-minutes and a second track of my fixations was gathered, again over a five-minute period, whilst I looked at a photographic record of the location used to make the first drawing. Methods of responding to and visualizing the data were refined gradually through years of studio-based research-led practice. It became apparent that there was two main approaches to visualizing the data without distorting its value, firstly, though a series of interconnecting points, locating each of the fixations in a sequence of perceptual encounters through a complex series of lines within a given framework, see Figure 6. The second was through a series of circular numbered shapes located within a given two-dimensional space, that directly translated the fixations, each of which varied in size according to the duration of the fixation, see Figure 7. Professor Gilchrist supported these early experiments by helping to adapt computer
programmes, used to read the eye-tracking data, in order to make the information more accessible and in a form more suited to software common to the creative disciplines. This enabled me to adapt the data to suit a variety of experimental approaches by creating a large number of file types for laser cutting, silkscreen printing and moving image work. The first exhibited artworks consisted of a series of handmade light boxes which contained layered glass-edge acrylic sheets between which were sandwiched coloured circles that correlated to my fixational eye-movements. They were layered in a sequence that responded to the time element of the trace as this factor dominated the information obtained. The speed at which the eyes moved was clearly visible from the mobile experiments as was the eyeball movement type, both of which are referenced in Active Vision. The light box pieces were constructed to embrace time by colour-coding the speed of the movements, for example a colour was identified to reflect fixations that fell between 300-400 hundredths of a second with another colour allocated to fixations that fell between another timeframe and so on. Throughout both eye-tracking methods, time was considered a key factor that impacted on my thinking and response to the data. Therefore the use of the circular metaphor embodied characteristics, which reflected a necessary level of significance. During the first static eye-tracking tests I felt that my vision was affected by wearing the eye-tracking device, its intrusiveness made me aware of a process that usually appeared to happen without conscious thought, much like breathing. During the lab experiments I approached the task of looking at the images in the same way I would a traditional drawing, the main difference being that I was not required to interrupt the act of looking by also looking at a drawing substrate. I looked at the scene making judgments about depth, angles and scale and studied the relationship between forms and the dispersal of people and or objects.
In essence I approached the task of eye-tracking drawing with the same set of questions that a traditional approach would demand. Figure 8 details the types of imagery using as part of the eye-tracking methodology, the right-hand image shows the outcome of the trace represented as a sequence of circular shapes; a clear correlation of marks can be seen within this arrangement of images. Until the use of this method was adopted previous drawing experiences were always punctuated by the opportunity to revise or correct; eye tracking prevents the act of amendment.

Throughout the duration of a trace, all eye movements are recorded however subtle: every moment of blindness, every response to a sound, every point of perceptual awareness becomes embedded within the final data. I felt that this act was the closest interpretation of perceptual truth in drawing that I could achieve. It removed, in its entirety, the opportunity to respond to a physical mark on a surface; a process I referred to earlier as vulnerable to perceptual history, that the pursuit of a truthful interpretation was simply unobtainable.
Figure 6. Connecting Fixations drawing, Ink & Gesso on panel, w.60cm x h.60cm, 2009, © the artist.

Figure 6 shows a drawing made using the mobile eye with fixation points mapping a sequence of looking through a series of connecting points. This approach meant that ‘blinks’ could be included, however at this time, I focused my attention towards developing the circular metaphor within my work as it could assume a time related meaning, through the depiction of fixation duration.

My reasons for placing greater significance on the circular, dot-based visual language were few but nonetheless important, the use of the circle as a metaphorical mark had phenomenological relevance; it represented a perfect form achieving a simple visual meaning: one of completeness. The fixation itself represents an inclusive perceptual event and although it should not be considered as singular, it is nevertheless an absolute occurrence, as, in order for it to conclude and another to take place, a perceptual resolution must arise.
The primary, symbolic representation of the circle as a ‘worldly’ structure enhanced the intentions behind the work drawing attention to the landscape subject of the eyetracking; attributes the circle possessed as a visual symbol combined to symbolize artistic engagement and intention. The materialization of the final drawings tested ideas of: interconnectedness, time and the illusion of depth.
After the mobile eye-tracking in Dundee six experiments were developed into four artworks for exhibition dissemination in 2007 (further details regarding exhibition outputs are explained in section 4.4). This new work represented a number of changes in the way it was considered and made, namely the work was no longer two-dimensional. In many ways the work made in 2007 was very experimental and brought about pivotal changes in my working practices. The artworks became more sculptural and explored installation based approaches including using the space that existed between the artworks to suggest a unified critical proposition.

The three-dimensional aspect of the work was becoming increasingly important as the data was based on experiential situations where the value of depth of field was significant. The mobile tracking experiments embraced this dimension. The device used, in mobile eye-tracking is not able to measure the depth that the eye reads accurately, possibly because the eyes can move at up to 20mph and are able to vary speeds between fixations considerably. However in the recorded footage, a crosshair moved around the video screen showing the eyes responding to objects, each with a

Figure 8: From Left to Right, photograph, in-situ drawing, eye-tracking drawing of the same scene
different location in space. The footage from four recordings was developed into four large-scale projections that had co-dependent parts. These four pieces consisted of short video clips of layered animations that were developed by plotting the movements of the crosshair. The underlying video footage of the landscape gradually faded out providing enough time for the audience to establish the purpose of the animation, leaving only the animated drawn marks dashing across the projected area of the wall. Each animation was projected on the gallery wall with the corresponding piece of eye recording projected on the opposite wall. Thus establishing a connection between the pupil activity in the eye recording and the animated mark, in essence the pupil movements created the opposing digital drawing, opening up a visible dialogue within the gallery space itself (see Figure 9).

The three-dimensional drawing project entitled *Explo
erations in Spatiality*, mentioned earlier, which took place at the University of Leeds in 2006, could in many ways be recognised as a contextual partner to the animated video projections described above as it embraced the notion of drawing as occupying space. It involved Claude Heath and Patricia Cain as invited artists. John Stell, co-author for the publication, wrote,

> The actual drawing here is not that on the surfaces, but is present in what we think of as empty space, which is really occupied by light. Light travels through space, but we only see it when it strikes a surface, or particles in space, or our own eyes (*op cit*, pp.13).

Stell’s words echo my aspirations for these pieces as they suggest to the viewer a new consideration for drawing, the drawing not as a physical entity as such; it exists as a modification in the way things are presented to us. The means of presentation is in the world but not in the same way as a drawing on paper might be.
Sokolowski refers to this phenomenon when he asserts ‘they are higher-level objects.’ ‘They are ‘out there’ as more complex modes of presentation, more intricate ways of being manifested (*op cit*, pp.96).’

The four pieces ranged from between three and four minutes long. Each animation was true to the original trace and a different visual quality was developed to describe each of the four experiments. The animation techniques employed used distinctly individual characteristics, two of which are described more fully here.

*Dots* (2007) was constructed from an experiment whereby I observed a landscape scene and draw it traditionally at the same time, therefore the eye movements flittered between the scene and a sketchbook. Afterwards I plotted the crosshair movements digitally with a simple ‘dot’; eventually the animated projection obliterated the scene under an ever-increasing number of dots that dominated the setting rather than the sketchbook area visible in the recording.

Another piece was entitled *One Second Line* (2007) consisted of lines that simply plotted one seconds worth of eye movements, approximately 4-6, then plotted the next second long sequence. The drawings possessed ‘darting’ properties with fast moving lines appearing briefly only to reappear in a different configuration elsewhere within the projected area. An example of the lines can be seen in Figure 10.

The animated projection pieces, along with another piece entitled *Second Sight* were the first interventions that explored the realm of spatial depth within my practice. Reflecting on the works from this period, it is clear that they marked a move away from the rigid scientific framework that I had imposed upon earlier work.
It was always my aim that the work could withstand scientific scrutiny as many so-called 'sci-art' works appear to be less robust when examining the true relationship of collaborative artworks, with the scientist often reduced to facilitator. My collaborative relationship was based on a strong partnership, one of mutual respect for each others working methods. It was my aim to create artworks that would equally inspire the scientists to perhaps consider their research outcomes and help to shed an unexpected light on their field of study. It remains peculiar that this objective was not achieved until I decided to break free of the constraints that working within the strict parameters of scientific data can cause. Until this point I had worked purely with the data given and had not altered its accuracy in any way to improve an outcome aesthetically.

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5. Sci-art was a term coined by The Wellcome Trust to identify a particular funding stream for collaborative biomedical projects between scientists and artists.
The problem with the data was that it did not provide an accurate depth reading and I was concerned that the work was very much about space but did not fully embrace it. Therefore made a decision to introduce spatial considerations through working more sculpturally; in many ways I began to visualise the data in space by developing a method of extruding the fixation co-ordinates in order to occupy a third dimension. 

*Second Sight* (2007) encompassed this newly-adapted methodology and the outcome impacted substantially on my practice, shifting my attention to embody a more phenomenological attitude. This piece still values the eye-tracking experience for its perceptual truth and doesn’t attempt to distort it, but it embodies judgment about the world, it articulates the presentation of parts of the world in both its presence and its absence through the use of light.
4.4 Publications and Dissemination

Solo and group exhibitions, with accompanied public events and talks, selected for inclusion in this submission took place between 2004 and 2010. It should be noted that these continue still but a cut-off point needed to be identified. Within the same period of time publications that supported the above exhibitions were produced along with peer-reviewed papers published as part of international conferences and research journals. The following text describes a selection of outputs chosen from the full list of twelve, which can be found after the concluding chapter.

The solo exhibitions identified were commissioned at the time by the curators in post, each of which represented an entirely new body of work for publication and public exhibition.


Moira Innes commissioned the exhibition entitled _Fabulous Confabulations_ in 2003 for Leeds Metropolitan University Gallery. The exhibition and public events took place between the 2nd and 30th October 2004; the exhibition focused on drawing and included some of the first work made using the eye-tracker at Bristol. A public talk by Professor Gilchrist and I was programmed into the schedule, the audience included individuals from both art and science communities.

In very general terms fabulous confabulations was concerned with the processes of memory and vision. Based around recalled landscapes from extensive travels, the body of work utilised the medium of drawing to explore the physiological processes of memory and vision working in conjunction.
The curator, Moira Innes wrote for the accompanying publication:

The resultant pieces are not however a romantic or nostalgic journey into the rural idyll, as one might be led to think given the combination of recalled Landscapes (2004).

The works attempted to respond to the complex processes at play within vision and perception and encompass the phenomenon of flashbulb memory. The exhibition itself ran for one month with an additional one month long residency period that took place prior to installation. During this time I started a five-metre long wall drawing that continued to be developed throughout the duration of the exhibition. This strategy enabled the general public to visually access my progress by means of a large glass wall opposite the wall drawing. The work was reviewed in a number of newspaper and web-based publications, in his review Robert Clark for the Guardian Newspaper (2004) described the work:

When we think of psychology in art we tend to think of surrealism’s blend of weird imagery and realist technique, but one has to look behind the surrealist scenes to find the visual equivalent of a literary stream-of-consciousness in the works of visionaries such as Artaud, Michaux and Gorky. Catherine Baker seems to relate to this sub-tradition, albeit maybe from a more scientific perspective.

He goes on to write,

…she has used research into perceptual phenomena to produce urban landscape drawings in which fragmentary glimpses overlap and breed into one another (Ibid, 2004).

In Tina Jackson’s review for Metro (2004), she refers to the scientific aspect of the work and the somewhat paradoxical nature of its relationship to drawing:

The complex images, comprising intricate patterns that look like abstracted lace, interpret the way the brain selects and stores information in layers. What’s unusual about this work is that the data has been transmuted into art through the most fundamental of means: drawing. Instead of conveying science through equally avant-garde techniques, Baker uses delicately rendered hand-drawn graphics to present Sci-fi possibilities.
The exhibition included: ‘Ways of Seeing…Art & Design Study Days’ at Leeds City Art Gallery with resident curator Amanda Phillips and a public talk by Professor Gilchrist and myself.

**Seeing, Vision and Perception in a Digital Culture 2008**

Peer reviewed international conference paper & publication, co-authored with Professor Gilchrist, CHArt (computers in Art History), Kings College, London and the University of London.

The 2008 CHArt conference took seeing as its theme and the associated questions of vision, perception, visibility and invisibility, blindness and insight - all in the context of our contemporary digital culture in which our eyes are assaulted by ever greater amounts of visual stimulus, while we are also increasingly being surveyed, on a continual basis. The conference aimed to investigate key questions: How have advances in neuroscience or developments in technology altered our understanding of vision and perception? What kind of visual spaces do we now inhabit? What new kinds of visual experiences are now available? And what are now lost or no longer possible? How does the increasing digitalisation of media affect the experience of seeing? What and who might be rendered invisible by the processes of digital culture? What are our current digital culture’s blind spots? What are its politics of seeing?

The conference papers were published online and became part of the CHArt Yearbook.

**Lines of Sight, (2006/7).** Public Art Commission, Mid Beds District Council.

The concept for the piece was derived from the strong architectural lines within the building, which reflect its transparency and the philosophical aims of the architect to create a building where both inner space and external space combine visually.
The idea for the commission was developed from research into vision and visual perception. This research formed the basis of the methodology used in the five public workshops that included over 120 participants.

An exhibition displayed: the artists working drawings, workshop drawings, a series of photographs by the artist, and both textual and visual information regarding the conception and production of the *Lines of Sight* commission. The installed exhibition remained in place for one year.

As part of the unveiling of the new building, the completed commissioned artwork was made public by HM The Queen and HRH The Prince of Edinburgh in an exclusive ceremony where the artist was invited to discuss the project with the Royal Party. There was extensive radio, newspaper and online local media coverage.

*Scanpath*, (2007). *Space 4 Gallery & South Hill Park Arts Centre*.

*Scanpath* was a commissioned solo exhibition & publication by Space 4 Gallery in Peterborough Museum and Art Gallery that toured to the Bracknell Gallery, South Hill Park Arts Centre, Berkshire. The Arts Council England, Peterborough City Council, and South Hill Park Trust generously supported it.

This exhibition represented a new body of work all made with the use of both mobile and static eye-tracking devices. The artwork on display denoted a significant shift in my practice; this exhibition contained sculptural, transient ephemeral shadow drawings, video projections and three dimensional objects. In addition to the exhibition, the gallery and museum hosted a public talk by Professor Gilchrist and
myself. All of the work developed for the show involved recording eye movements and using the eye movements to create drawings that bypassed the hand; in effect creating drawings directly with the eye. There was radio and press coverage and an online review by Rob Myers, well-established writer for Furtherfield. In a long review, Myers (2007) states,

Scanpath is a postmodern depiction of the artist at work, not in the studio or in the fields but in their mind, or rather in the activity of a specific subsystem of their brain.

He concludes with a comment that reflects my own thought towards inter-disciplinary collaboration,

...and it shows that even the most sophisticated and voluminous datasets created by the most advanced technological systems can benefit from interpretation by a creative artist, and vice versa.


A creative collaboration between RMIT University, Melbourne, and University of the Arts London. The following extract was taken from the UAL web pages:

‘DRAWING OUT was a trans-disciplinary conference. It explored drawing across the boundaries of disciplines. It addresses drawing as a way of thinking and communicating in the twenty-first century. Whoever we are, drawing is part of our everyday and professional lives. The conference investigates the role of drawing in its widest possibilities, such as physical and virtual drawing; Aboriginal and Torres Strait Islander cultural practices; digital schemas; fashion templates; architectural and engineering designs; creative writing; media and communications concepts; cartography and scientific schematics; architectural and mathematical modeling; business and financial mapping; legal, educational and political visualizations.’
5. Phenomenology: experience of place

Figure 11. *Second Sight*, Space 4 Gallery - on the occasion of the exhibition *Scanpath*, 2007, © the artist.

*Second Sight* (2007) consists of 172 clear acrylic spheres ranging in size from 18mm – 150mm diameter. They can be seen in Figure 11. What can’t be seen clearly in this image is shown in figure 12; the accompanying shadow drawing created directly by the presence of the spheres. This piece was conceived for the exhibition *Scanpath* at Space 4 Gallery in Peterborough in 2007 and later toured. It was developed from a one-minute section of a five-minute eye-tracking experiment. The original eye-tracking drawing involves me looking at a scene very similar to the one illustrated in Figure 8 as mentioned earlier, I had become concerned that my work, although very much about physical space and my movements within it, did not manifest fully this aspect of the drawings. After a number of trials I developed a method of translating the circular shapes from earlier drawings into three-dimensional forms; maintaining
the circular language and all it stood for. I decided very early into the making process that the spheres should possess a reflective surface for a number of reasons that related to emergent concerns.

My interests in what the spheres represented as moments of perceptual awareness developed from actual fixations, demanded that they be understood as a sequence or stream of perceptual encounters and consequently should not to be seen in isolation. I needed to decide upon a surface quality that was vulnerable to its surroundings whilst also being susceptible to the impact of changing light conditions.

It was my aim to develop the orbs to create an additional ephemeral drawing that shifted in response to its surroundings. This is manifest in the shadow drawing in Figure 12 that revealed itself discreetly under natural light conditions, and more noticeably when artificial lighting was introduced as ambient light failed.

![Figure 12. Second Sight Shadow Drawing detail, Space 4 Gallery, 2007, © the artist.](image)
At points throughout the day the monofilament line that connected the spheres to the ceiling template seemed invisible under certain natural light conditions, however when lit, the lines can appear to capture light and add a new visual dimension (see Figure 13).

![Image of spheres hanging from the ceiling]

**Figure 13. Second Sight (detail), 2007, © the artist.**

The reflective quality of the thermoset resin surface used was much like glass, had a similar appearance, and had the ability to reflect its surroundings in its surface. It was of extreme importance to me that the chosen acrylic resin would possess properties that enabled each sphere to reflect the place in which it is installed but most importantly all the other spheres. This material enabled each sphere to embody the experience of the others in its surface; their interrelatedness became unmistakable to any viewer.

The balance between presence and absence became accessible in each orb whilst simultaneously presenting the shadows made by the presence of each sphere as an acknowledgement of its absence. This process of seeing the absence of something presented to us as an identity given, is a form of transcendental reductionism in that
the viewed experience instantly provides a link to the absent entity through both the language of the three dimensional drawing in itself and the shadow drawing created. The shadows embodied absence and their infinite connections above and beyond what we can see as an external event. Fundamentally the meaning comprehended by the visual experience essentially communicated two key things: firstly, that the orbs (parts) can be part of a whole but can become themselves whole when separated and secondly, that moments cannot exist or be presented apart from the whole to which they belong. The fact that the singular orb can be experienced as a singular reality whilst its surface suggests an experience beyond what is tangible in the physical world provided the metaphor for a phenomenological visual language for me as an artist (see Figure 14).

Working three-dimensionally to create an installation-based drawing happened for the first time in the making of Second Sight. My practice at this stage had undergone a critical, physical change, from working on flat surfaces to exploring drawing as a three-dimensional concept more closely allied with the eye-tracking experience. Sokolowski suggests that all experience involves a blend of presence and absence and he describes the analogy of looking at a cube and that we are able to experience the absence of the non-visible sides, they are given but precisely as absent, they are part of the experience (op cit, pp.17-18). He also explains the certain necessity in the way moments are blended together in their wholes.
Some moments are founded upon others and a distinction arises between the *founded* and *founding* parts. He states,

> A whole can be called *concretum*, something that can exist and present itself and be experienced as a concrete individual. A piece, an independent part, is a part that can itself become concretum. Moments, however, cannot become concreta. Whenever they exist and are experienced, they drag along their other moments with them; they exist only as blended with their complementary parts (*Ibid*, pp.24).

He goes on to describe the dangers that being able to consider moments as simply by themselves, as *abstracta* causes, because we can refer to a moment, without mentioning its associated moments, we may begin to think that this moment can exist by itself, that it can become concretum. He asserts that this can lead to a philosophical
‘problem’ of separating the mind from the worldly context to which it naturally and essentially belongs (*Ibid*, pp.25).

But the mind cannot be separated out in this way; the mind is a moment to the world and the things in it; the mind is essentially correlated with its objects.

This brings us back to the earlier Plato reference regarding the ‘bridge established between the observer and the observed thing’ as correlates. As Aristotle\(^6\) asserts ‘the rational soul is somehow all things.’

In many ways these quotes link to the work of Hamish Fulton, a British artist for whom the experience is in itself the work.

On his website (2000), a changing, rolling dialogue is accompanied by the omnipresent sound of his footsteps. One page rolls through a series of lines of text that continuously form new interpretations but culminate in the following statement:

Only art resulting from the experience of individual walks a walk has a life of its own and does not need to be materialised into an artwork an artwork may be purchased but a walk cannot be sold

Through this site and additional documentation, Fulton expresses his thoughts that the artwork is secondary to experience and an experience simply cannot become the artwork. Richard Long shares similar concerns to Fulton but there is a clear

\(^6\) The quote by Aristotle is paraphrased from the many translations given for Aristotle’s works (350BCE). Smith, J.A. 1994-2000, pp.71 provide the closest possible translation used for this thesis of Aristotle’s writings about the Soul, from © The Internet Classics Archive.
distinction between the two. Long often makes works within the landscape, albeit sometimes ephemeral, whereas Fulton often makes graphic works after the event or he uses photography to describe an occurrence.

In the book *El Camino*\(^7\): *Rutas Cortas Por La Peninsula Iberica*, published by Fundacion Ortega Munoz, Hamish Fulton’s work consists mainly of photographs taken by the artist on a series of walks on the Iberian Peninsula (Fulton, 2008). There are photographs of worn out walking shoes, hostel receipts, tent photographs and overall words and numbers used in conjunction with each other along with photographs to reflect the experience. Although our work contrasts in its materiality, I feel allied with Fulton in our shared understanding of the world as the ultimate setting for ourselves and for all the things we experience. This thought encompasses a concept described by Sokolowski as *Singulare Tantam (op cit, pp.43-44)*, there could only be one of them; the world and I are correlated with one another, two singularities.

In most of the body of work referenced in her interviews for the publication *Dessins*, Roni Horn talks about a coherency achieved by combining drawings into a singular outcome, through the act of cutting multiple drawings and reassembling them as one, a shattering of connection; proximity can compound meaning or, conversely, it can fragment it (Horn, 2003, pp. 27).

She states, no matter how dismembered a drawing might be, it is held together by the different stages of nearness. The process of unification within drawing for Horn is paramount and parallels the most recent works that I put forward for consideration within this thesis.

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These drawings are a development from *Second Sight* and present drawing again in a three-dimensional form. In figures 15 and 16 the drawings can be seen installed embracing two alternative installation approaches. The first image shows them following a Global Positioning System trace from my studio to the gallery space, some 90 miles apart, linking the space where the work is made, the making of the work itself, and the act of showing as a unified experience. In Figure 16 they are arranged to create a raised circle; when the folded drawings are attached point to point they form a sphere referencing both my desire to reinforce the circular shape within my work and to embrace the phenomenological notions of a *singulare tantum*.

**Figure 15.** *Fragmented events*, Mixed media drawing installation, Norwich, 2009, © the artist.

In the book simply titled Anthony Gormley – Drawing, Gormley refers to drawing in similar ways to Horn,

> Drawing is analytical but its also expressive in its own right, it has a duty to bear witness, not simply by making a representation of something, but taking apart and reassembling in a way that makes new connections (Gormley, 2002, pp.6).

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8 In the book Drawing, Anthony Gormley (2002), the introduction is written by Anna Moszynska. The introduction includes and interview between Moszynska and Gormley, quotations taken from that interview(s) that appear in this thesis acknowledge Moszynska as the author.
He also describes the act of drawing as a foray into the contemporary experience, as trying out thoughts and, in the case of his own drawings, executed with an immediacy that enables that ‘truth’ to be fragmentary and cumulative rather than unified and singular.

Despite these reflections by Gormley I still see the manifestation of the work shown in Figures 15 and 22 as a process of unifying the truth within the experience of drawing with one’s own body as tool, acknowledging each folded form as one of the ‘moments’ referred to by Sokolowski (*op cit*).

![Figure 16. Drawing Connections, Milton Keynes Gallery 2010, © the artist.](image)

The process of folding the drawings into a unified form fragments them but also facilitates new connections; the juxtaposed drawings, made through the act of folding, create numerous manifolds and facets. As detailed in Figure 17 each one of these forms reveals a different kind of drawing: some made using the eye-tracker, some
with GPS devices, some conventionally approached, and some depicting the scenes that all of these different approaches to drawing have originated from. My concerns remain rooted in a physical and philosophical consideration for drawing but what ties all the work cited here together is their condition of being one becoming something whole.

Figure 17. Fragmented events – Kusudama (detail), 2009, © the artist.
6. Conclusion

This thesis has referred to specific works throughout its duration although a far larger body of work is presented for consideration. As a collection it responds to the development of drawing practices that break free of convention and embrace technologies found in different disciplines. What ties the practices of the artists cited here, including myself, is our shared interest in the physical embodiment of mind, world and body in drawing practice. It recognizes the place of traditional drawing practices and does not seek to devalue them in any way but articulates the changing face of contemporary drawing made possible through collaboration. Most importantly in my own work, the thesis lays claim to the significant role of eye movements in drawing and their contribution to the pursuit of truth within observational drawing, embracing an objective, empirical stance and the subjective stance of the artist. Philosophical notions of presence and absence have been presented through a discussion of various drawn outcomes produced over a number of years, which seek to establish the value of the eye-tracking experiments within a phenomenological consideration of drawing.

Not all the work made within the identified period has been examined, but the selection is considered to have had a far greater impact on my understanding of drawing and the philosophical considerations I have allied with drawing. The absent artworks might perhaps create a more complete narrative but the constraints of this document cannot support their inclusion. The chosen pieces, however, articulate key moments in my practice where shifts in my thinking or method took place, such as the point at which the drawn outcomes came to occupy three-dimensional space and became free of a support, separating the drawing from its ground. The drawing
process cited here is one of cognition; it embodies the process of perception at its core, it reasons and judgments are made which extend the language of drawing beyond simply the representation of objects. The materialization of the drawing here is defined by the generating process, it may demand some form of accompanying explanation, but its structure allows it to articulate meaning through a considered and thoughtful analysis of data. Each decision communicates through its visual representation; paramount is the relationship between the component parts of the artwork whereby each fragment should and can be accessed singularly but is understood only as part of a wider understanding.

The proposition for drawing presented in this thesis has been developed over years of a practice-led enquiry. It occupies a space within contemporary practice but also within the wider critical context of drawing research. Research in this field emerged as a strand within drawing practice; it has developed a significant position within what is now considered to be an autonomous discipline. It is important to take account of the location of drawing as a diverse domain open to further scrutiny, searching for a distinct definition, yet with a desirable mutability, which might actually prevent such a conclusion ever being reached. Endless manifestation and applications may facilitate an ongoing dilemma for drawing as new considerations are debated and discussed by the practitioners of drawing in an ever-expanding field. It is intended that the practice central to this document will contribute to further research, providing a platform for future investigations where artistic responses to our visual world test our understanding of the medium of drawing by exploring new concepts underpinned by rigorous practice-led enquiry.
In *Writing on Drawing* (*op cit*, 2008), Deanna Petherbridge describes drawing ‘as natural ‘truth’ (that is analytical tool of mimesis)’ and attributes it with a comprehensive list of functions and considerations that have been disputed and substantiated over time. She goes on to suggest that what can be extrapolated is not a definition but ‘its irresolute status – neither entirely medium nor message.’

The futility of attempting generalizations acts as an analogue of the very condition of drawing itself. Drawing is an immanence, always pointing to somewhere else – to a chain of serial development, another condition, another state, even when, as a gestural flourish it appears to have said everything in the most economical manner (*Ibid*, pp.37).

As drawing research continues, proposals that focus on innovative judgments regarding this diverse field will come to light, challenging further our understanding of drawing as an ever-expanding genre. My own conceptual investigations into drawing as a perceptual phenomenon will continue in the future as new areas for research have emerged through a synthesis of reflection and a desire to extend the dialogue expressed here. Sculptural and installation based methods of communicating and connecting the drawing to an absent place by fusing both the drawn outcome and the actual object as witnessed have been identified as areas for development. In addition the notion of ‘blindness’, blinking and the constant shutting down of our visual systems, which occurs in saccadic eye movements, offers new areas through which I can continue my practice-led research. A more in-depth enquiry regarding the concept of vision in relation to phenomenology is planned by investigating mobile eye-tracking used in conjunction with both GPS and additional devices capable of measuring emotional responses to a stimuli/place.

In many ways it is not possible to highlight all of the new ideas that have emerged from this research, however, what is certain is my underlying interest in how artists
define themselves beyond tradition, this will continue to be pursued as advances in new technologies become available.

It is my hope that my research and outcomes will influence and inform others as to the value and potential for interdisciplinary collaboration. This isn’t a new concept by any means but many sci-art projects do not fully grasp the potential of a mutually beneficial partnership, which should inspire both sides. Such partnerships fail when the balance tips too heavily in one direction, causing one side to act as technician to the other. The partnership referenced throughout this document remains as productive now as it ever was, discussions are underway for future research projects and this can be attributed to a respectful, reciprocal working practice. In the same way that I have benefitted from being part of a questioning environment, I hope that the outcomes evidenced here, will encourage and support other artists who seek new challenges in areas of research that may be outside of their own.

As new research into the relations between vision and drawing emerges, it is my hope that my contribution fosters an understanding of the immense importance of vision as a bridge to the world, a means by which we can attempt to understand change and can make connections above and beyond simply what we see as the result of a biological function. Our understanding of the complex processes involved in translating experience as a drawn material outcome will, no doubt, continue to attract inquiry, indeed my own curiosity longs for further exploration. Most imminent is the need to further explore the folded drawings and their connection to both place and viewer through light as a metaphor for confirming a reality.
Through drawing it becomes possible for us to not only articulate visually the way things are, but to also convey a mode of presentation to other people and ourselves at other places and other times. The artist as ‘recipient of action’ communicates the world through his/her chosen means; within this context the artist is defined as the receiver. In the same way that the artist can be the dative of manifestation for things that appear, the artist as central, the viewer also becomes the dative for that which the artist may imbue; dative as receiver. It is a distinct duality where interpretation may fluctuate and fracture, an interpretation that cannot be predicted, Sokolowski concludes,

Any truth that we achieve is always surrounded by absence and hiddenness, by mystery, since the thing we know is always more than we can know, the reference is always more than the sense.

(*)op cit, pp.176).
List of Published outcomes


Glossary
For the purpose of this document the subsequent terms are defined as follows:

Scanpath
A scanpath is a sequence of eye fixations made when viewing a visual scene.

Fixation
The point in the visual field that is fixated by the two eyes in normal vision, and for each eye is the point that directly stimulates the fovea of the retina.

Saccade
Rapid eye movements that occur when the eyes move from one position to another, within the visual field.

Lux
The Latin term Lux, refers to the phenomenon of light, or light as it is experienced in sight, composed of colour, shadow and visible qualities. Generally speaking Lux is the subjective experience of light (Vasseleu).

Lumen
The Latin term Lumen, refers to the physical movement of invisible rays of light whose perfect linearity is the essence of illumination and requires no organ of sight. The passage of Lumen is transparent and unperceivable (Vasseleu).

Concretum
A whole can be called concretum, something that can exist and present itself and be experienced as a concrete individual. Part of the whole (a piece), an independent part, is a part that can itself become concretum. Although it is stressed that it should be understood as part of a whole.

Singularare tantum
A noun (in any specific sense) that has no plural form. In this context it is used to describe, in a philosophical sense, the world and ‘I’ as correlated with one another. Two singularities combined to produce one.

Stereoscope
Stereoscopy (also called stereoscopic or 3-D imaging) refers to a technique for creating or enhancing the illusion of depth in an image by presenting two offset images separately to the left and right eye of the viewer. Both of these 2-D offset images are then combined in the brain to give the perception of 3-D depth.
References:


Bibliography


